

ARMED FORCES

ARMY • NAVY
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**OCTOBER
1956**

Feature

**The Army's Era
Of Management
By General Taylor**

On The Cover

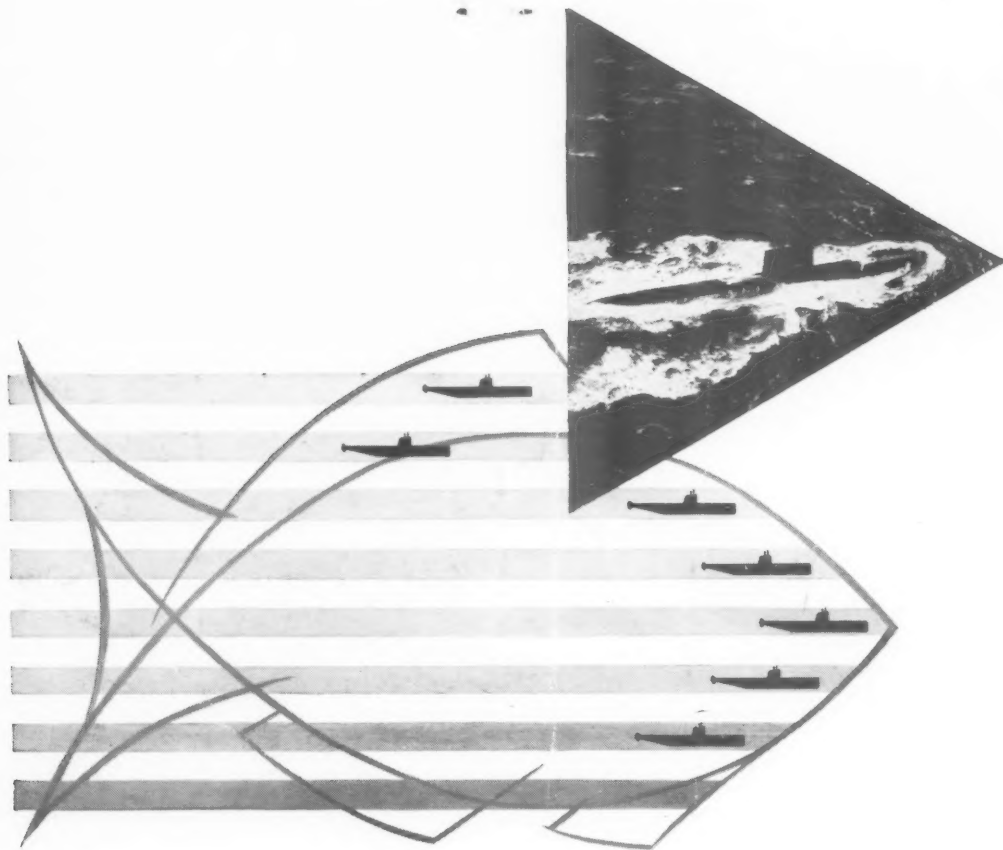
Maxwell D. Taylor was graduated from the United States Military Academy, West Point, New York, No. 4 in the class of 1922, and was commissioned a second lieutenant in the Corps of Engineers.

To improve the welfare of his own troops, in December, 1953 General Taylor initiated a large-scale educational program to give all non-commissioned officers at least a eighth-grade education and all other soldiers at least a fourth grade education. By November, 1954, nearly 18,000 had raised their educational level to minimum standards. From November 1st, 1954, General Taylor was placed in command of all ground forces in Japan, Okinawa and Korea when he took command of the combined staffs of the United States Army Forces, Far East, and Eighth United States Army with headquarters at Camp

and Japan. Effective April 1, 1955, General Taylor was named Commander-in-Chief of both the Far East Command and the United Nations Command.

On June 30, 1955, General Taylor was sworn in as Chief of Staff, United States Army.

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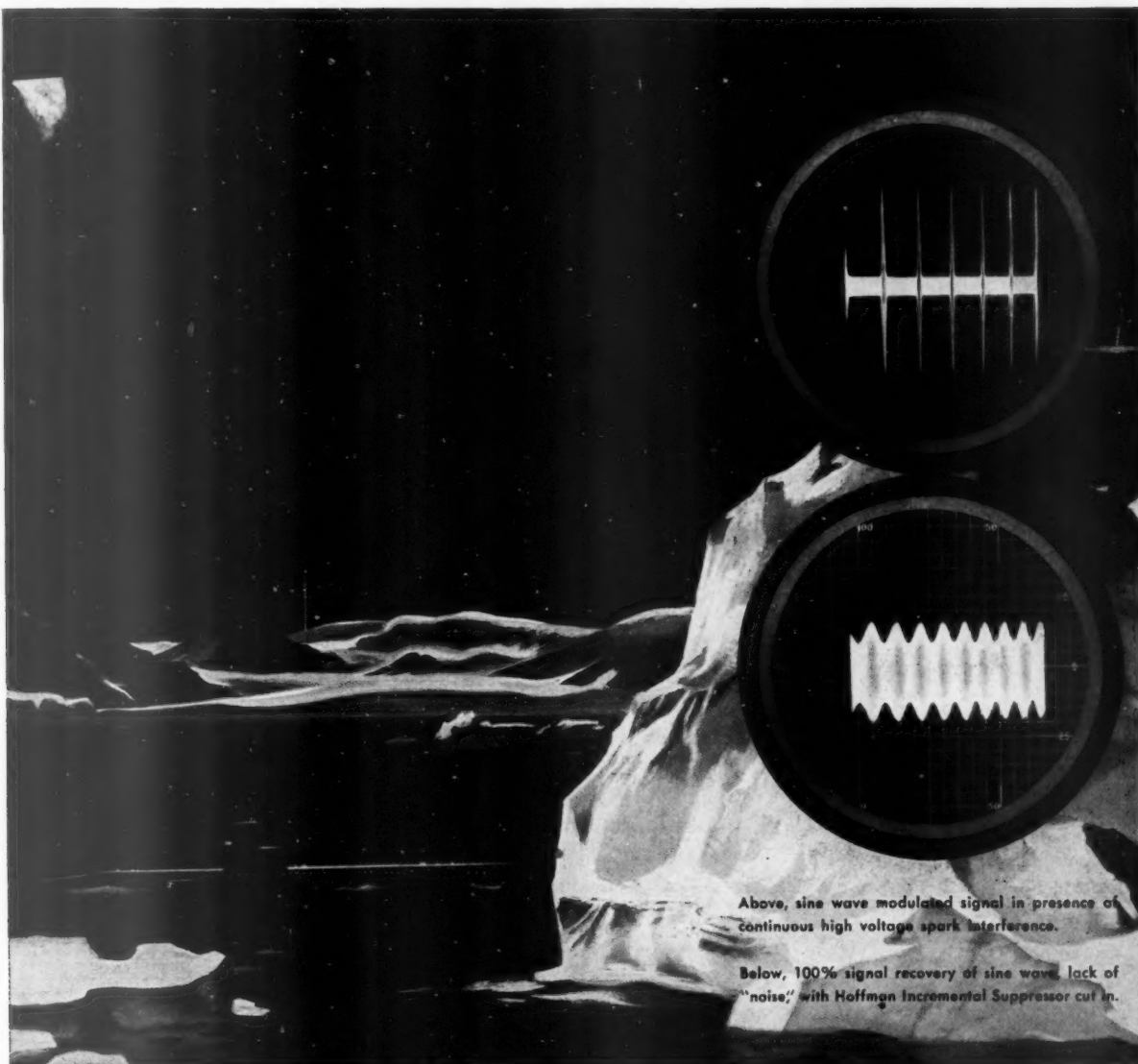
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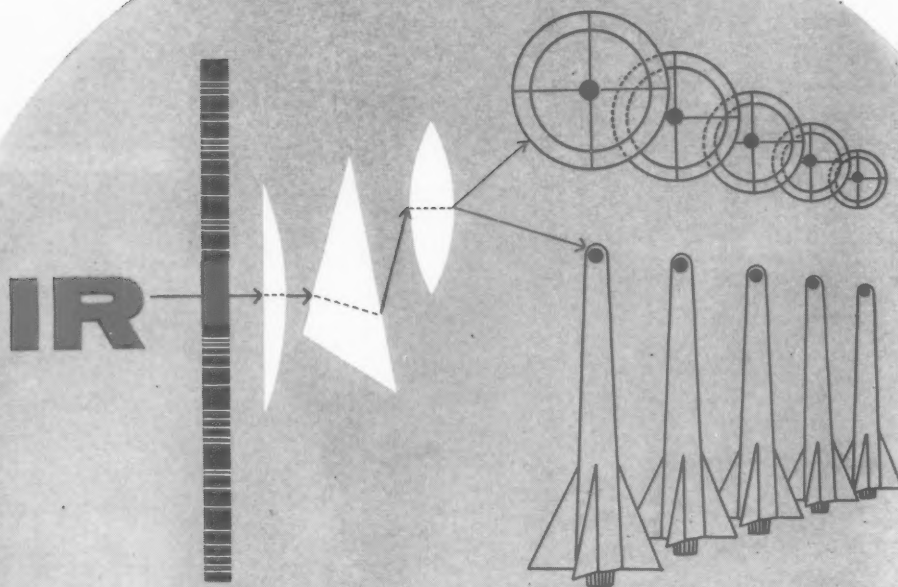
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OCTOBER 1956

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Volume 3

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Number 1

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ARMED FORCES MANAGEMENT is published monthly by the Professional Services Publishing Company, Roy B. Southworth, President, Editorial and Business Office, 208 South Second Street, Rockford, Illinois. Publication office, 404 N. Wesley Ave., Mount Morris, Ill. Accepted as controlled circulation publication at Mount Morris, Illinois. Copyright 1956 by the Professional Services Publishing Company. Title registered, U.S. Patent Office. Six weeks notice before next publication date required for change of address. SUBSCRIPTION RATE: One Year—\$3.50; Two Years—\$6.00; Three Years—\$8.00. Single copy \$.35—Bound Volumes \$10.00.



Every wolf would like to eat a porcupine. Few of them get around to it. What makes the porcupine's meat so good, of course, is the fact that he doesn't have to do any running. Wolves, by and large, are an ill-tempered, frustrated lot, while you almost never see a neurotic porcupine. He figures it's cheaper to carry a quiver full of arrows than to get ulcers from hiding. There are predators of the sky, too, and helping keep them in a state of frustration is REPUBLIC'S job building THUNDER-CRAFT.



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by **General Maxwell D. Taylor**
Chief of Staff, United States Army

THE ARMY'S ERA OF MANAGEMENT

FROM a scientific point of view, this is the era of atomic power and supersonic speed. From a military point of view, this is the era of increased firepower, mobility, and flexibility. From an industrial point of view, this is the era of improved management. The role of good management in the United States Army has become of increasing importance in supporting the Army's mission of providing for national security.

Prior to World War II each Army post, camp, and station had a distinct individuality generally reflecting that of the commanding officer. In these enclaves there were almost as many standards of management as there were posts. The day is past when such diversity in management procedures is acceptable. There is room for only one standard of management—the most efficient and best.

Numbering over a million soldiers and 400,000 civilians directly associated with it, the Army is a great fighting organization and at the same time, a great administrative organization. The two cannot be separated because they are a unit of effort. The Army administrator in his office contributes directly to the success of the fighting leader in the field who, in turn, must administer intelligently and efficiently the combat unit which he commands.

As applied to the Army to describe its administration operations, the term "big business" is not an exaggeration. Many people like to compare the size of the Army with the size of private corporations, although obviously the two are not entirely comparable. The purpose of a business is to produce profits; whereas the Army's purpose is to produce security, a product which cannot be measured in dollars and cents. Yet to carry out its mission, the Army is necessarily one of the world's largest organizations conducting business-type operations.

The size of the Army and its deployment throughout the world create management problems that did not exist prior to World War II when military forces were smaller. Weapons, ammunition, vehicles, and other equipment are much more costly today than before. The new weapons and equipment add new possibilities to the strategical and tactical employment of Army forces but also add increased costs to Army budgets. To pay these bills, the Army must hold down administrative costs. To this end, we look to improved management to assure that not a dollar is wasted or diverted from our primary purpose of having a combat-ready Army.

The conduct of Army business is a challenge to our

leaders. To do their jobs, they must have considerable knowledge of science, finance, engineering, and business methods. They need to keep abreast of the latest techniques in many fields of management. Some of these techniques are readily available for adoption from the civilian world; others peculiar to military requirements must be devised within the Army itself.

There is constant activity in the Army to improve its business procedures. To cite a few examples, I would mention the following: management appraisal surveys of selected organizations, such as depots, Technical Services, and installations to include small elements, such as motor pools and processing points for personnel; studies of major functions such as procurement, storage, issue, and reclamation; reviews of administrative procedures, such as the volume and flow of paper work; and surveys of the utilization of manpower, materiel, and facilities. The Incentive Awards Program stimulates improvement in various areas by offering incentives to new ideas and by helping to instill the need for improvement and cost consciousness in the minds of all Army personnel, both civilian and military. Almost 62,000 separate suggestions were submitted during FY 1955, which benefited the Army by over \$20 million during one year.

In the Army, as in any other large organization, efficiency depends to a large degree upon the ability to identify and reward deserving personnel. For several years the Army has been developing a method for measuring the work performed in non-tactical operations under the name of Performance Analysis. By this procedure, we undertake to determine the productivity of manpower by relating the time expended in doing a piece of work to the number of man hours which should have been spent according to an established standard. Thus it is possible to determine a relationship between individual and ideal performance. This approach gives a way of measuring the effectiveness of individuals and their relative contributions to the attainment of the job objective. Thus, the ideal standard established by the system becomes a sort of par for

the execution of the work and provides an incentive to the workmen to reach that par.

The Army gives recognition in its school system to the need for better trained military and civilian managers. Courses have been incorporated emphasizing general management, management engineering, and financial management.

Under the training program for general management, the Army school system provides officer courses on present-day concepts of management and upon new developments in administration. These management subjects are given progressively increased emphasis as officer students advance through the various echelons of the school system. Whereas in the past, the school curricula included almost exclusively tactical instruction, now they give due recognition to the fact that an officer spends perhaps half of his time in non-tactical installations in positions requiring a business type of training.

At the top of the management training program in the school system is the Command Management School at Fort Belvoir which gives senior officers and key civilians advanced training in this field. The course lasts for three weeks and each year accommodates about ten classes of 50 students each.

The Army also utilizes the civilian school system to supplement instruction in general management. It sends officers to special management courses such as those at Harvard and Pittsburgh Universities. Here our officers exchange experiences with their counterparts in private industry to the mutual benefit of soldier and civilian. Through these mutually beneficial contacts, the Army has access to the best management concepts and practices in the civilian world.

The Army has a mounting requirement for technicians who specialize in various aspects of management. In order to develop individuals of this sort, the Ordnance Corps operates a Management and Industrial Engineering School at Rock Island Arsenal. This valuable institution is available to train personnel drawn from the entire Army. It provides a series of short, intensive courses in various analytical and control techniques which are

needed by the engineers and operators of the industrial type activities of the Army. To date, about 5,000 students have completed these courses which range from management seminars to studies of work planning and control.

Excess paper work has always been a plague in the Army and the bane of the junior officer. Effective steps are being taken to reduce the volume of paper work wherever found. As a result, the Second Hoover Commission's Task Force on Paper Work Management noted that the Army had less paper work on a per capita basis than many large private companies. By rigidly restricting the creation of new reports, by improving the design of forms, by expediting the disposition of records, and by reducing the over-all number of documents printed it is possible to make continuous progress in this fight against excess paper work.

Among the important Army management programs, the Army Program System adopted in 1950 deserves particular attention. This system provides a method for directing and administering the Army's varied activities which are grouped into functional areas called Programs. This is the Army's method of telling widely dispersed commanders what to do and how to do it. In addition, the Programs provide guidance as to the necessary men, money, and materiel needed to accomplish assigned tasks.

As in the case of big industry, the first step in Army programming is a determination of over-all objectives in functional fields such as personnel, materiel, and facilities. Then, specific objectives are established and published in program documents along with the necessary supporting policies and schedules. In turn, the operating agency, such as an overseas command or a technical service, prepares more detailed plans in support of those emanating from higher authority.

The Program System operates at all levels of command. At the Department of Army level are the over-all programs of work to be accomplished by the entire Army. Throughout the chain of command, each command receives guidance from the next higher echelon in

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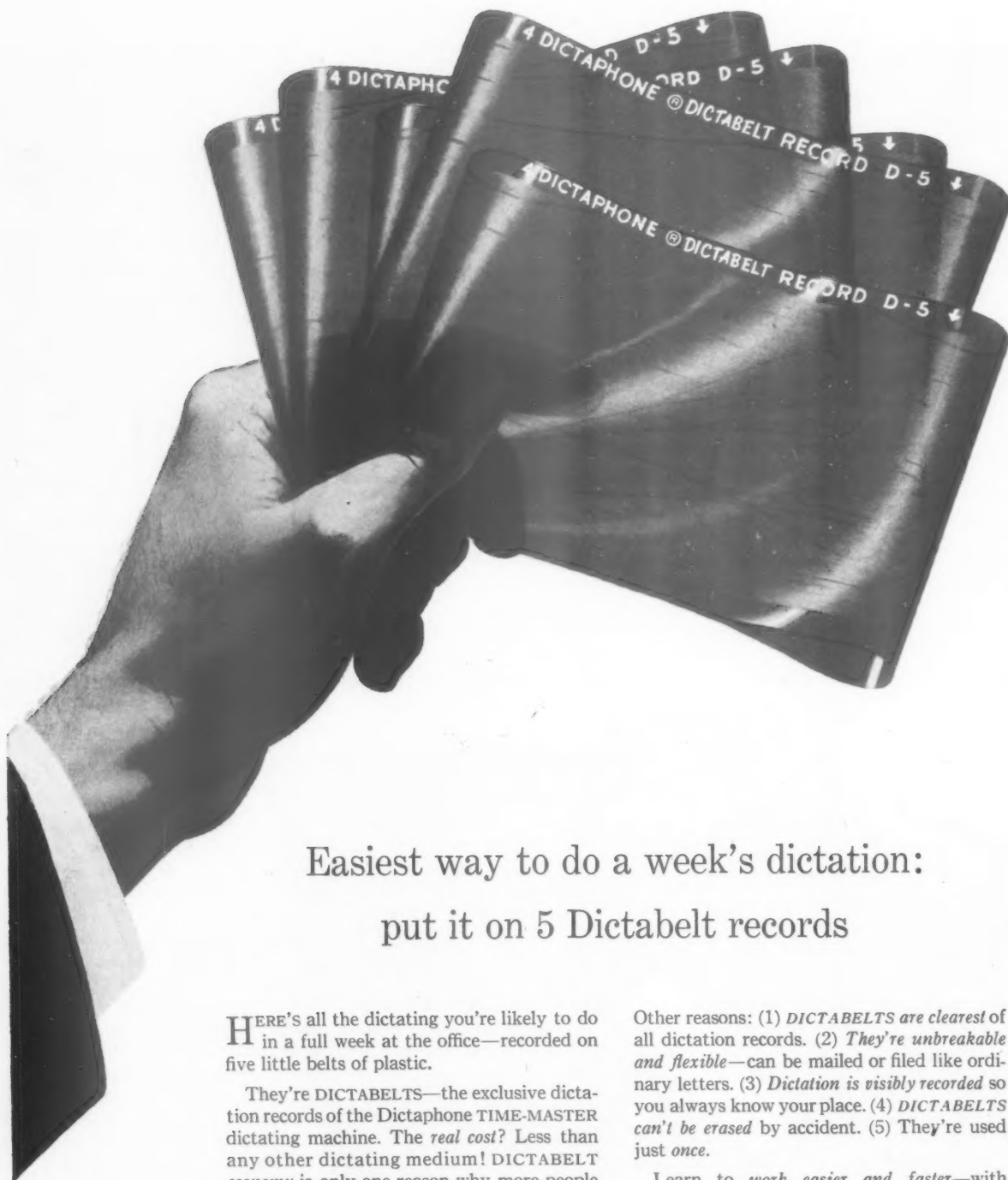
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formulating its own plan of operation. In this way the entire Army is tied together with common, planned objectives, each organization carrying out its portion of the total effort.

Planning and executing a program are two management steps which are obviously necessary to accomplish objectives or missions. However, it is also imperative to review and analyze the progress being made in carrying out the plans, so that we may know not only where we have been, but also where we are going, and how well we are doing. Much as an industry continually studies trends in sales and adjusts its production to them, the Army constantly reviews its programming in the light of changing world conditions, manpower ceilings, and other factors that might require a modification of the Programs. By such a periodic review and analysis we gauge our progress, maintain synchronization of operations, and set new goals when necessary.

Within the last few years, the Army has also developed a financial management plan to assist management both at the departmental level and at subordinate command levels. It consists of six elements: cost of performance budget, financial property accounting, stock funds, consumer funds, integrated accounting, and internal audit. A major goal is the development of the cost of performance budget, whose successful development and use depends on many of the other elements. Such a budget will enable a commander to forecast his need for resources by applying the costs of doing the work. Under the old plan, the commander was given, not money, but free issue of supplies. Now, if he is to live within his cost budget, the local commander must spend his money wisely and only for those items which are essential to accomplish his mission. The value of this new system is that, by giving the consumer—that is the local commander—money, and by requiring him to purchase his supplies with that money, he will be in a position to exercise more careful accounting of the financial value of resources required to carry out his mission.

The various elements of the Fi-

nancial Management Plan have been tied together in a single operating system, called the Army Command Management System. There are two aspects of this system, one for Class I activities, and the other for depots. The Class I Command Management System, already in operation at Fort Jackson, Fort Gordon, and the Military District of Georgia, is a systematic procedure for relating financial operations to the installation's programs from their inception, and also for concurrently evaluating performance in financial terms. It provides the commander and his staff with operating statements which reveal actual budget costs compared with original budget estimates, the manpower used compared with original estimates, and the effectiveness of the performance of personnel.

The Depot Command Management System applies to depots the same general objectives at the Class I Command Management System, and is already installed at Letterkenny Ordnance Depot and the Atlanta General Depot. Present plans for Army-wide use of the Command Management System are well advanced throughout the continental United States. They should be completed and in operation during FY 1957.

Men, Money, and Materiel have been the traditional "Ms" in our logistical equation. But the complexity and extent of our logistical activities are such that we must impose the fourth "M"—Management—on our operations to produce a combat-ready Army. No other military service has forces deployed so widely about the globe as does the U. S. Army. In consequence, our management personnel must plan and operate against unusual time and space factors. The Army logistical staff must not only provide a large volume of supplies to its using units, but must also seek to simplify logistical operations, increase operational effectiveness, and decrease costs.

Logistics management involves more than the procurement and distribution of supplies. It involves the use of people as well. The proper handling of manpower is more essential to over-all success than the handling of supplies. The efficient management of over one

million men requires the highest order of leadership to derive the maximum contribution from their aptitudes and potentialities. They must be properly selected, assigned, and trained. The effective must be recognized and rewarded, the ineffective identified and retrained or replaced. Directing these operations we need able professional leaders.

Good management is, indeed, merely one expression of good leadership. Today, the good commander must also be the good manager. In many ways, it is more

difficult to provide effective leadership in the management field than in the tactical field, but it is as essential in the office as on the battlefield. It is the purpose of the Army to develop leaders in management who will display in our offices, shops, and depots the universal qualities of leadership: professional competence, human understanding, and personal integrity. With such men in charge of Army business, there can be no question about the effective use of the national resources made available to the Army.



On Fire?

The familiar phrase, "where there's smoke, there's fire," is definitely not true in the above picture. The smoke actually represents progress in safety instead of a destructive fire about to devour an expensive jet airplane.

This USAF Martin B-57 tactical bomber is demonstrating an improvement in jet engine starting without the use of ground power. A new propellant developed by Standard Oil of Indiana is being tested with the self-contained starters made by General Electric Company's Aircraft Accessory Turbine Department in Lynn, Massachusetts.

In the photo both engines were started at the same time. The left engine starter is burning the old type of propellant that emits a considerable amount of smoke while the right engine is equipped with the new and improved "smokeless" propellant which eliminates practically all of the smoke.

Called the AS-12 Turbostarter, the unit weighs only 60 pounds and will start and assist jet engines to idling speed within 25 seconds. The

ground crew inserts a standard cartridge into the starter located in the engine bullethead and the pilot merely presses a button when ready to start.

With this lightweight system, planes can operate from the most rudimentary air bases even when no ground support is available. At any base, instantaneous group take-offs are now possible without waiting for ground power—allowing the planes to be dispersed for maximum protection against air attack. The ground power equipment seen in the photograph is used for test purposes only.

Lockheed to Operate Electronic Brain for Intercontinental Missile

A new lightning-fast "electronic brain" computer, which will solve some of the problems involved in the development of the nation's vital intercontinental ballistic missile, will soon be put into operation by Lockheed's Missile Systems division.

The electronic genius, known as the Univac Scientific 1103A and the first of its kind ever built, is

the only machine in the world versatile enough to interrupt one complex problem to solve a new, high priority problem while retaining all work on the first in its "mind" for subsequent solution.

"High speed calculations by the computer will give us very rapid solutions to some of the problems involved in the research and development of newer, faster, and more complex weapon systems," said Dr. Werner W. Leutert, head of the missile division's mathematical and computer services department.

Dr. Leutert said that Lockheed's missile scientists and engineers will use the new equipment for such computations as flight paths for orbiting vehicles, nuclear reactor problems, missile trajectories, flutter analysis, heat transfer problems, and many others.

RCA Awarded Service Contracts By Navy, Veterans Administration

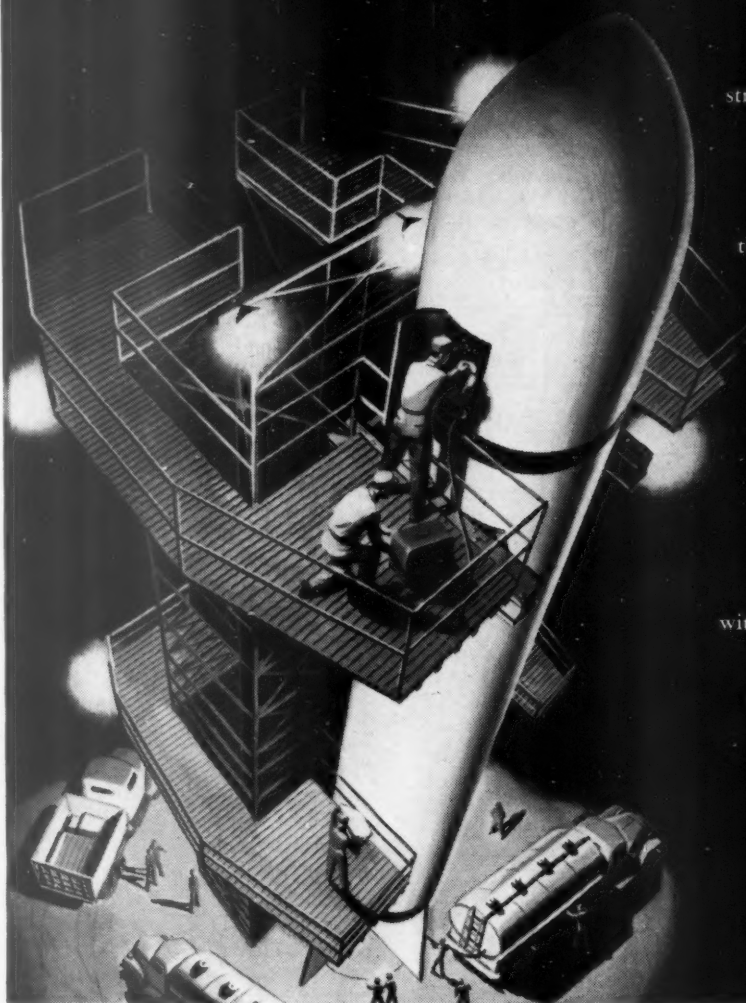
RCA Service Company, Inc., has been awarded contracts for servicing sound motion picture equipment for two branches of the Government, it was announced by W. L. Jones, Vice President, Technical Products Service Department.

Mr. Jones said his organization will be responsible for the repair of 16 mm equipment used abroad U. S. Navy ships reporting to New York. Included in this equipment is RCA, Bell & Howell, DeVry and Ampco, and service will be carried out at RCA Service Company's New York repair facilities.

In addition, RCA will inspect and maintain 35mm projection and sound equipment as well as radio receiving and voice transmission equipment now installed at 145 Veterans Administration hospitals throughout the country. Mr. Jones said this equipment will be serviced through his organization's nationwide district offices.

- Program to relieve engineering shortage has been introduced by several Midwestern metalwork companies. They hire science students on high school graduation, pay 75% of their tuition through night school engineering. Degrees take 8 years. *Industrial Relations News.*

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The Role of Management Tools in Making Military Decisions

By David Novick and G. H. Fisher

Part Two

Some Examples

The Cooper Committee report dealing with the research and development area* is an example of a financial management proposal made without first giving sufficient consideration to basic decision-making areas and without examining the use of alternative management tools. This report proposes a rather elaborate accounting system

*Research Activities Working Group Report on Research and Development, prepared for Advisory Committee on Fiscal Organization and Procedures, Office of the Secretary of Defense, Washington, D.C., July 1954.

In the first (September) installment of this article, the authors stressed the importance of obtaining a thorough understanding of the key decision-making areas in an organization before attempting to introduce management tools to assist in management decision processes.

Examples of cases where this was not done, and the consequences resulting therefrom, are given in the present installment. Also, the various types of basic military management decisions are presented and discussed briefly. The following (November) installment will include a discussion on the selection of appropriate management tools to assist in making these basic military decisions.

to be used as an aid to management of R & D in the Department of Defense. During the course of the discussion the report says: "Accounting reports set down for the record the dollar facts of operation. When purposely designed and properly used, they can and should serve as an aid to management in measuring results against standards set, in appraising accomplishments against the costs incurred and in planning the future in the light of the past."*

In an industrial production con-

*Ibid., p. 83.

text such language makes sense. But in the military R & D area, it is not at all clear whether the quotation has any meaning. Questions that immediately come to mind are: Can we set up "standards" in R & D work? How are "results" or "accomplishments" to be measured? Suppose there is a difficult technical problem that is "bottlenecking" a certain project, and that several capable scientists are assigned to think about the problem. At the end of the accounting period, the records give the dollar costs of the salaries of these men. But they have been sitting in a room thinking. How does one measure the "accomplishment" to "balance off" against the cost? Or suppose the men come up with a brilliant solution that has far-reaching implications not only for the immediate project but for others also. How measure the accomplishment?

Again returning to the above quotation, just how useful are the "dollar facts of operation" from a management control viewpoint? To answer this question, one must first consider broader questions. For example: What is "management control" in the R & D area? What is "efficiency"? What is the "product" in R & D? These things are pretty well nailed down in industrial production management; apparently they are not in the nebulous area of R & D—perhaps they cannot be. But certainly some thought must be given to such questions before one attempts to set up an accounting system for R & D. Thus, we return to the original point: if a process is to be "controlled" from a management standpoint, it helps to know something about the process and key decision-making areas involved in its execution. This, for the most part is lacking in the report.

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The report also furnishes an example of misplaced emphasis stemming from taking a narrow view of the problem area. The proposal suggests that:

Each person in a research and development installation should record his time [by project] on a timecard, sign the card and send it along for approval by his immediate supervisor. . . . Management needs and must have knowledge of the manner in which effort is being applied to the technical program, the cost of such effort and the extent to which total costs are kept within estimates, objectives, and authorizations.*

Perhaps so; but it is not clear that this sort of detailed accounting is worthwhile in an area like R & D. Furthermore, since the resources available to be used for management tools are limited, we should concentrate on the really important management decision problems. In R & D the fundamental problem would seem to be something of the following sort: the problem of making weapon R & D decisions (now), in the face of great uncertainties, in such a way that at a future time period (say 5-10 years from now) we shall have a "reasonably good" menu of weapon system choices from which procurement decisions can be made. If we fail seriously in dealing with this problem, the loss is apt to be incalculable. Here, it would seem, is where our main efforts should be directed, rather than toward developing elaborate accounting systems for R & D which will tell us that scientist X spent two hours on project A, 3½ hours on project B, and 2½ hours on project C on December 6, 1954.

Another error which occurs frequently in many of the recent management proposals stems from the confusion of the role of various management tools in the decision-making process. The result is that a management tool is often assigned a task for which it is not designed. For example: . . . "cost budgeting is recommended because it is designed to fix attention on the value received for the resources consumed, i.e., the most economical means of accomplishing program objectives."** Here we have a confusion between "cost budgeting" and "operations research." Cost

budgeting merely traces out the resource cost implications of a specified program; it does not enable the manager to determine the "best way" to accomplish the program. The latter is the realm of operations research. A typical operations research problem is something like the following: For a specified task to be done, and with given quantities of certain types of resources on hand, what is the combination of resources which will accomplish the assigned task at minimum cost? In sum, operations research involves an *optimization process*; cost budgeting does not. Therefore, to assert that cost budgeting *per se* will enable one to determine the most economical way of doing something, is to assign it a role which it cannot carry out.

Again, along this same line of thought, many of the reports repeatedly talk about "cost as a measure of performance." This represents a confusion of terminology or of concepts, or possibly both. In any type of activity where a task is to be accomplished, inputs (manpower, materials, etc.), are injected into the operation or production process and the final result is, we hope, output. The measure of the inputs is "cost"; but cost itself does not give a measure of performance. For example, in private industry we get an over-all measure of performance by computing: revenue minus cost equals profit. Here it is clear that cost is only a part of the picture, and that it, in and of itself, does not give a measure of performance. Although there is not a one-to-one correspondence between operations in private industry and operations in the armed forces, cost alone cannot be a measure of performance in the military any more than it can be in business.

Cost may, however, be used as a *criterion* in certain types of analyses. For example, consider an operations research problem where there are numerous alternative ways of accomplishing a specified task. The problem is to select the "best" of the alternatives. A convenient way to tackle the problem is to fix a level of performance, run

the various alternatives through the analysis, and finally rank the alternative methods on the basis of cost required to accomplish the specified level of performance. The "best" alternative then is the one which attains the fixed performance requirement at least cost. Here cost is the criterion for judging among alternative courses of action, given a specified level of system effectiveness. This is entirely different from what is implied in talking about "cost as a *measure* of performance."

Closely related to the discussion in the preceding paragraph is the matter of "efficiency." Practically all of the recent financial management proposals say something about accounting contributing to more efficient operations in the Department of Defense. Just how is not made clear. Also no explicit definition of "efficiency" is given. This is not surprising, because formulating a meaningful concept of efficiency in military operations is not easy. Furthermore, accounting, *in and of itself*, can rarely make a major contribution to management efficiency no matter how one defines the term.

There is really not much to be said about concepts of efficiency *in general*. To be meaningful, one must consider efficiency in the context of a specific operation or process. Actually, efficiency is purely a relative matter, and the problem of formulating a concept of efficiency ultimately reduces to the problem of setting up criteria for evaluating specific operations. The operations research example discussed above affords an illustration. The problem was to determine that alternative course of action which attained a fixed level of performance at least cost. Here cost is the criterion, and we can assert that if alternative X will accomplish the assigned task at less cost than alternative Y, then X is "more efficient" than Y. Thus, efficiency in this case is *defined* relative to the context of the problem; in particular it is defined in terms of cost with the level of performance or effectiveness fixed.

Another example of the relative nature of efficiency is the case where standards are used. Suppose industrial engineering techniques are used to set up standards for various tasks performed on a jet engine overhaul line in an Air Force

**Ibid.*, pp. 65-66.
***Financial Management in the Department of Defense, op.cit.*, p. 23 (italics added).

depot. These physical standards may be priced out to obtain a "standard cost" for jet engine overhaul for various levels of output. Then the accounting data reflecting costs of actual operations may be compared with the standard costs, and the operation may be judged "efficient" or "inefficient", depending on whether actual cost is equal to or less than "standard" or is greater than "standard". Here again, efficiency is defined relative to a criterion for evaluating a specific production process. Also it is clear from this illustration that accounting *per se* cannot provide the means for making efficiency evaluations. Other tools must be used in conjunction with accounting information.

Although more could be cited, the above examples should serve to indicate that in some of the recent financial management proposals insufficient thought has been given to such questions as: (1) the nature of basic problems involved in key management decision areas; (2) differences in decision problems in military operations *vis-à-vis* private industry; (3) what management tools may be used in conjunction with budgeting and accounting; and (4) in general, the relationship between financial management and over-all management.

Military Management Decisions

As pointed out previously, a major thesis of this paper is that in dealing with the subject of management tools and how they may aid in over-all management, careful consideration must first be given to the nature of the problems involved in key management decision-making areas. Once something is known about the decision-making processes, then the various management tools (including budgeting and accounting) may be considered in the light of problems involved in these areas.

Since decision making is the very essence of management, a discussion of types of military management decisions seems appropriate at this point. Obviously this is a complicated subject, and only a very summary treatment can be given here. Even a limited discussion of types of military management decisions may, however, be of

value in dealing with the problem of financial management in relation to total management.

For purposes of this limited discussion, military decisions may be divided into three broad classes:

- (1) Operations decisions: how to deploy and use forces in being.
- (2) Procurement decisions: what equipment, men, etc., to buy.
- (3) Development decisions: what equipment to develop, so that at a future date there will be a reasonably good menu of weapon system choices from which procurement decisions can be made.

*This classification of types of decisions was developed by C. J. Hitch, Chief of the Economics Division of the RAND Corporation.

Admittedly this is a highly simplified and somewhat arbitrary classification of decisions. But certainly no one would deny that these types of decisions are the really important ones. In fact, in a broad sense, one can almost say that how well the U.S. might do in a future war with the U.S.S.R. depends on how well we make these decisions *relative to* how well the Soviets make similar decisions.

The key factor which differentiates among the three classes of decisions is the time at which the decision affects the combat capability of the military forces. On the *average* these time impacts are probably somewhat as follows:

Operations decisions: immediately

Procurement decisions: 3-5 years in the future

Development decisions: 5-10 years in the future.

Thus time is of the essence, and this in turn has an impact on the nature of the decision-making process. For example, as the "lead time" increases—as it does as one goes down the list—the element of uncertainty increases markedly. This means that the decisions tend to become more difficult as uncertainty increases.

In a sense the whole structure rests on the development decision area. Development of a weapon system takes a long time; and *development decisions made now will determine what range of choices of weapon systems will be available, say 10 years hence, from which procurement decisions can be made.*

Thus, if we make the "wrong" development decisions (i.e., "wrong" relative to development decisions made by the enemy), then the loss at some future date is apt to be incalculable.

The conclusion seems inescapable: making good development decisions (relative to the enemy's decisions) is absolutely vital. Therefore it would seem that we should consider every possible management tool or method of analysis to be used in conjunction with intuition and judgment to help make good decisions in this key area, or if possible to enable us to "hedge" against the possibility of making wrong decisions.

To be sure, procurement and operational decisions are very important, too; but development decisions have a special importance since they comprise the first link in the chain of types of decisions. A point of particular interest from the standpoint of this paper is that financial management apparently can contribute little toward helping to make the basic decisions in the development area.

(Continued in November issue)

Bendix Flight Control Systems To Equip 707's

Bendix Aviation Corporation's Eclipse-Pioneer division has received a \$2.5-million order for PB-20 Automatic Flight Control Systems for the Boeing 707 jet transports, Roy H. Isaacs, division general manager, announces.

Deliveries on the order placed by Boeing Airplane Company are scheduled to begin in April, 1957. Initial systems were slated for American Airlines and Trans-World Airlines versions of the 600-mile-an-hour luxury jetliner.

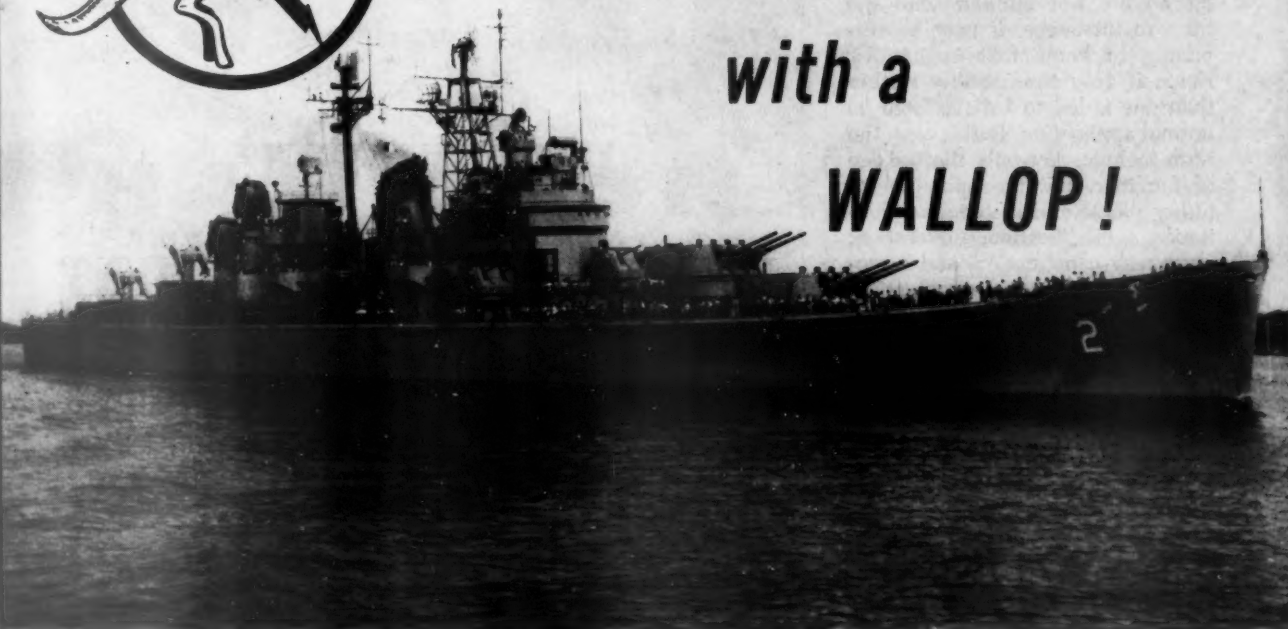
The Bendix official described the PB-20 as embodying the most advanced thinking, commensurate with proved design, that is available today for completely automatic control of jetliner flight along radio directed paths through the sky and down to an airport runway. Transistors and magnetic amplifiers have completely replaced vacuum tubes and the entire system has been designed on a building-block or modular principle of construction.



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a salute to the officers and men of U.S.S. Canberra

Proudly named after Her Majesty's Australian Ship Canberra lost early in World War II, and the only ship in our navy named after a foreign capital, the U.S.S. Canberra has recently been recommissioned as the world's second guided missile ship. It was formerly a heavy cruiser.

In every sense, the U.S.S. Canberra belongs to the electronic age. Its electrical system could supply a city of 50,000 people. Its electronically guided missiles, known as TERRIERS, are among the world's most lethal anti-aircraft weapons. These are designed to intercept aircraft at ranges and altitudes far beyond those of conventional anti-aircraft guns.

The Canberra's crew of 76 officers and 1,241 enlisted men are trained and inspired to make the ship a tremendous fighting unit as well as a historic departure in naval operations.

RCA is proud to have had a part in equipping this great ship, by providing electronic equipment and systems that represent the most advanced thinking in navigation, communications and fire control.

AMONG THE ELECTRONIC EQUIPMENT AND SYSTEMS SUPPLIED BY RCA FOR U.S.S. CANBERRA ARE...

"Mark 4" target designation systems (for conventional guns and guided missile target designation)

SPS4-A radar repeaters

CIC control monitor

SRR communications receivers

INTERESTING FACTS ABOUT U.S.S. CANBERRA

The engines, developing more than 200,000 horsepower, can drive ship at speeds in excess of 30 knots.

Automatic dial exchange serves 210 telephones. In addition, 1,000 sound-powered phones are used.

Electronics switchboards are made up of 100,000 contacts and employ 23,000 vacuum tubes (many of them supplied by RCA).



DEFENSE ELECTRONIC PRODUCTS

RADIO CORPORATION of AMERICA

CAMDEN, N. J.

AFTER ALMOST two years of analysis, experimentation, and development, the Air Force is ready to implement a new system of management controls for the maintenance of Real Property. Incidentally, if you are not familiar with the term maintenance, it may be surprising to know that in the Air Force it goes considerably further than one is led to believe from its normal application. In this case, the term includes not only the upkeep of facilities, but the operation of utility plants and systems, rehabilitation, modification, alteration, some new construction, and essential services such as fire protection, aircraft crash rescue, sanitation and custodial services. In terms of money, it is a \$500,000,000 a year operation. The man on an Air Force installation who has the specific responsibility for this function is the Installations Engineer.

The system does not overlook the local conditions and problems of the man who, like the one in Alaska, spends a good deal of time worrying about keeping his facilities from freezing. On the other hand, it has taken into account the problems of the gentlemen from the deep South—who at this moment are probably discussing maintenance of air-conditioning units. Every phase of its development was carefully scrutinized and, when possible, subjected to conditions that account for the unusual.

The outcome? The system should work anywhere. But more important is the fact that there is a built-in savings potential, the results of which is equivalent to what would otherwise require literally thousands of additional workmen.

The story begins some three years ago with a careful look at the ability of the U.S. Air Force to maintain its Real Property holdings, then valued at \$13 billion. The examination brought to light a series of rather discouraging facts:

First, the rate of growth of facilities that required and would require maintenance was from approximately \$10 billion in 1950 to \$13 billion in 1953. By the end

IMPROVEMENTS to the MAINTENANCE MANAGEMENT of AIR FORCE REAL PROPERTY

of 1960, these will have increased in size to about \$20 billion. Second, considering the Air Force manpower ceiling and analyzing the trend of appropriations, it seemed conclusive that increases in maintenance resources in proportion to the expanding plant were most unlikely. Third, the methods and procedures that were being used in the maintenance and operation of these facilities were hopelessly outmoded. Finally, but by no means least, the facilities were not only increasing in size but in complexity as well. This may be illustrated by just one example from many.

Take, for instance, the maintenance of hydrant refueling units. The modern plane, particularly the heavy bomber, has a fuel storage capacity that is so great that refueling by the tank truck method may be compared to filling the gas tank of your car with a one-gallon dipper. For this reason a hydrant refueling system has been designed to bring a tremendous flow of fuel to the plane almost instantly and an added advantage of being able to fuel as many as 20 planes at the same time. Envision the complexity of controls and equipment required to provide instantly a flow of fuel at the rate of 600 gals per minute to a desired outlet merely by the push of a button at the outlet point. Similarly, the flow is halted

instantly by the push of another button. With the main pumping equipment centralized in some instances as far as ¼ mile from the outlets, imagine the intricate piping and relay systems involved to allow the use of 20 refueling outlets individually or in any combination. The "know how" required to maintain these is removed from the talents of a hammer and screw-driver mechanic.

The awareness of these shortcomings led to the launching of a two-pronged program to reflect on every facet of the management end of the maintenance function with the objective of producing modern, simple, clear-cut concepts by which more and better maintenance could be accomplished with a personnel and dollar scarcity.

It was clear that some of the problem areas could be solved only at Headquarters USAF; matters such as the writing of manuals, standardization of training programs, and authorization of personnel, for instance. On the other hand, in order to develop better management at base level—the market for our product, so to speak—it would be necessary to develop and work out ideas at an actual air base.

This story deals only with the developmental work accomplished by a group from the Air Staff at Hq. USAF, selected to work on the

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Installations Engineer base level problem areas. The group was given carte blanche authority to deviate from all existing Air Force regulations, manuals, directives and the like. The group's mission, as formally stated, was "to develop and install at an Air Force base an integrated system of management controls for the Installations Engineer functional areas suitable for use at all bases." Because the management controls involved would cut across the Air Staff, representation was solicited from interested directorates of the Air Staff: Installations, Supply, Accounting, Transportation, Manpower, Organization and Civilian Personnel. To formalize their actions, they were formed into a Board entitled the "Ad Hoc Board for Improvement of management Controls in the Installations Engineer Functional Areas." Later this was abbreviated through common usage to simply the "Moody Board", since the air base selected for the experiment was Moody Air Force Base, Valdosta, Georgia.

Work began in 1954 and was scheduled to develop in four phases. First, there was an analysis of the problem to determine specifically where management shortcomings lay. From this, development for improved management techniques were to be made. To insure complete usability, and as a measure of effectiveness, each step of development was to be tested by actual implementation. Finally

after a sufficient period of testing and refining, implementation was to follow by the publication of a series of manuals and directives.

The initial phase (analysis) showed that seven maintenance management areas needed exploration and considerable revision:

1. Organization.
2. Flow and Control of Work.
3. Supply Support.

4. Transportation.

5. Cost Procedures.

6. Property Accounting.

During the early period of the build-up to 137 wings, several functions had been added, others modified and still others deleted. As a result, the existing organization structure prescribed for the Installations Engineer was no longer in line with the assigned responsibilities, nor did it lend

(Continued on page 43)

General Douglas MacArthur made his promised return to the Philippines on Oct. 20, 1944, when United States forces landed on the east coast of Leyte Island.

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is again this year offering at cost handsome bound volumes of the previous year's issues. Finished with a red leatherette cover, Volume II, October, 1955, to September, 1956, issues, is available for \$10 by writing Armed Forces Management, 208 S. Second St., Rockford, Ill. Orders for last year's Volume I exceeded supply, so we suggest you mail your order now.

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"ARE YOU SENDING YOUR WINNERS AND THEIR SUGGESTIONS TO ARMED FORCES MANAGEMENT?" Other installations are interested in your program. Send them to—"The Editor", ARMED FORCES MANAGEMENT, 208 South Second Street, Rockford, Illinois.

U. S. Naval Supply Depot, Scotia, New York. One of the first official acts of Captain H. E. Cole, USN, newly appointed Commanding Officer, was to present award checks to Depot employees. Mr. Frederick Falso, Test and Repair Branch, walked away with the top award of \$115 for his idea of an upward counterbore tool. The idea has been forwarded to the Navy Department for consideration at other installations.

Palm Beach Air Force Base, Florida. Master Sergeant Culmer E. Darby, USAF, 174 1st Air Transport Squadron, recently designed a simple but efficient tire-changing sling. Cutting the time and personnel in half previously needed to change a tire on a heavy transport, the idea is available to your squadron by writing the Base.

Hickham Air Force Base, T. H. This famous base boasts the top idea-man in the Air Force. T/Sgt. James A. Walker, assigned to the 47th Air Transport Squadron, has been in the Air Force ten years and in that time has submitted 236 inventions and suggestions. One of his most recent was an internal combustion engine of high torque and low r.p.m. Although his inventions have been for the greater part in the mechanical and electronic fields, he has also designed administrative offices for smoother flow of traffic.

Department of the Army. Estimated savings of more than \$18-

million will result from suggestions submitted by civilian and military personnel during Fiscal Year 1956, the Department of the Army has announced. A total of 71,741 recommendations were received and of these, 58,897 suggestions made by civilians and 12,844 offered by military personnel were adopted at installations in this country and abroad. Army civilians received a total of \$398,828 for their ideas. Nearly 4,000 more suggestions were received during Fiscal Year 1956, than for the previous year, despite a decrease in strength. The largest cash award was presented to Walter A. E. Appenbrink, of St. Louis, Missouri. He received \$1,125 for suggesting the elimination of a Department of the Army form, and in addition, proposed in detail new procedures to be used. As a result, the Government will save an estimated \$500,000 annually.

Naval Air Station, Jacksonville, Florida. Maintenance personnel of VS-6 salvage damaged aircraft tie down reels instead of discarding them. Since April, 400 reels have been repaired, saving the Navy \$2240. The old reels are completely disassembled and inspected to determine damaged parts, and without the purchase of replacement parts, sufficient serviceable ones are available from every five reels to make four new ones.

Marine Corps Air Station, Cherry Point, North Carolina. Mr. John L. Midgett, a civilian employee, has been presented with an Incentive Award by BuAer for his money-saving air inlet test duct holding fixture. Consisting of a fixture on four casters that can be kept in test cells, which supports all the weight of the test duct, not only does it have additional safety features, but presents a great reduction in man-hours.

Brooke General Hospital, Fort Sam Houston, Texas. More than 10 enlisted men have won suggestion awards at the hospital recently. SP2 Rex Hallford, last month's first prize winner, devised a four pocket wrapper to hold four syringes instead of wrapping each separately. Time of wrapping is halved as is the laundering of 55,000 wrappers yearly, and an estimated savings more than \$1,000 yearly will be realized.

Kindley Air Force Base, Bermuda. Colonel Philip H. Best, USAF, base commander, recently presented cash awards totaling \$260 and ranging from \$10 to \$100 for the nine best suggestions received during the first half of 1956. The largest winner of \$100 was A/1C Max L. Wyatt, with A/2C George R. Webb running second with a \$50 award.

Fort Lawton, Washington. Sergeant Milton M. Jones, an MP in Detachment 4, 651st Service Unit, has been issued a patent on a gasoline tank filler device to prevent spilling gasoline from military vehicles. The patent was secured through the assistance of the Quartermaster General, and the idea may be used by the armed services without paying royalty.

Norfolk Naval Shipyard, Portsmouth, Virginia. Some recent winners in the Beneficial Suggestion Awards at the Shipyard include Mr. Horace V. Robinson \$300; Earnest F. Cooper, \$125; and Edward R. Perkinson, \$105. Mr. Robinson's idea to redesign catapult deadloads aboard carriers is estimated to save the government \$17,000 each year. The modification of daily work sheets won the award to Cooper, and an improved method of striking waterlines on vessels by using giraffe and chalk-line was the suggestion of Mr. Perkinson. Recognized throughout the Navy for their suggestion program, Norfolk Naval Shipyard has been responsible for the savings of many dollars.

Pine Bluff Arsenal, Arkansas. Colonel Robert W. Breaks, Commanding Officer, recently presented cash awards to 16 employees for outstanding suggestions. Mr. Darrell B. Christensen received the

highest award of the presentation of \$450 for proposing a change of height-of-fill tolerance on the M1 HC Smoke Pot production line which saved the government \$50,000 in the first eight months of operation.

Stead Air Force Base, Nevada. Colonel B. E. McKenzie, USAF, Commander of Stead, has recently announced that for the first six months of this year, Stead employees turned in 21 suggestions, with seven accepted, four rejected and ten still pending action. A total of \$350 in awards was presented to those whose suggestions were accepted.

Marine Corps Air Station, Quantico, Virginia. S/Sgt. William Festing, Jr., is the proud recipient of a letter of appreciation, for his idea to prevent the rudders on aviation rescue boats from freezing during cold weather. When the boat would not operate because of frozen rudders during a crash call in 1954, Sergeant Festing went to the boat's manufacturer in Baltimore. By studying blueprints he found that the bottom of the rudder tubes could be sealed off using grease. The idea was tried and it worked at a saving of time and effort. Colonel James L. Neefus, USMC, presented the letter of appreciation.

Naval Air Development Center, Johnsville, Pennsylvania. A machine made from scrap and salvage parts by Aviation Machinist First Class K. Deakne, USN, is easing the dismounting of fighter and bomber aircraft tires. According to NADC reports, from one to five manhours is saved from each tire changing. Hydraulically operated and capable of dismounting all sizes of tires, damage to wheels costing up to \$800 each has been eliminated.

Loring Air Force Base, Maine. Major General Walter C. Sweeney, Commander of the Eighth Air Force, recently presented a check for \$50 to T/Sgt. Clarence E. Becknell, announced that he had been named Outstanding SAC Idea-Man of the past six months. Submitting three accepted ideas, his latest management improvement suggestion was for a "Boom Surge Boot Puller."

Fort Bragg, North Carolina. Mr. Victor E. Fields of Post Transportation, recently received an award check for \$450 from General Osborne making a total of \$925 awarded him for two suggestions which have been adopted army wide. Mr. Fields constructed and put into use a Helicopter Main Rotor Balancing Stand and a Dynamic Rotor Balance Stand effecting a savings of \$67,000.

Naval Air Station, Alameda, California. Thirty-six NAS employees were recently presented awards totaling \$620 for beneficial suggestions that will save \$8,520 for the government. NAS Alameda, recognized as another leader in the Beneficial Suggestion Program of the Navy, each month contributes many dollar-saving ideas to the Naval Establishment.

Little Rock Air Force Base, Arkansas. Brigadier General J. J. Preston, 825th Air Division Commander, recently presented M/Sgt. Richard C. Bertram, M / Sgt. Howard D. Commons, and M/Sgt. Will A. Neilly, each with a chrome B-47 model and \$10 for ideas submitted to Management Improvement. Sergeants Bertram and Commons won their awards for an idea on the use of a die test to determine the adequacies of control column detent ring and link assembly of the aileron disconnect mechanism. Neill's idea pertained to nacelle intake dust excluders for B-47's.

AMF's Turbo Division Dedicates New Research, Development Center

American Machine & Foundry Company's Turbo Division recently dedicated its new 66,000 square foot advanced research and development center, one of the most modern facilities in the United States for the development of accessory power supplies for guided missiles.

The AMF Turbo Division was the first to develop the small accessory power supplies which have been used in several missiles including the Douglas "Nike" and "Sparrow" and the Convair "Terrier," as well as in several "Drones." The Turbo Division is now working on an Air Force contract to develop and manufacture accessory power



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supplies for the intercontinental ballistic missile "Atlas."

The accessory power supplies are compact, light-weight power sources for the electrical and hydraulic circuits which activate the "heart" and "brains" of guided missiles. The integrally designed units consist of a fuel system, hot-gas generator and power turbine components, which drive specially designed, high-energy alternators and fluid pumps.

Controls for "Junior" Jets

A quarter-million dollar development laboratory for testing small gas turbine engine controls was opened recently as part of General Electric Company's Small Aircraft Engine Department at Lynn, Massachusetts.

The test stands are now being operated, along with analog computers, to test individual and complete control systems of the T-58 and J85, small gas turbine engines under development for the U. S. Navy and U. S. Air Force, respectively.

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SERVICE SCHOOLS

The Industrial College of the Armed Forces, Fort Lesley J. McNair, Washington, D.C. The twelfth post-war class of 1957 composed of 42 senior Army, 33 Navy, 39 Air Force, 7 Marine officers, and 23 senior civilians from selected agencies of the Executive branch of the government, recently started instruction. The class is the largest in the history of the College, and after a nine-month concentrated course will graduate on 12 June 1957.

Industrial Management Society, 35 East Wacker Drive, Chicago 1, Illinois. Two of the world's outstanding lady industrial engineers will headline the 20th Anniversary Time and Motion Study and Management Clinic, sponsored by the Society, October 31, November 1 and 2, 1956. America's Dr. Lillian Gilbreth, so-called "mother" of motion study, and England's Anne G. Shaw, consultant to leading British industries, will discuss "Industrial Engineering: U.S.A. and England". Reservations may be made for the three-day Clinic at the above address.

Dover Air Force Base, Delaware. A special two-day course in "Introduction to Management" has been established by Base Training for those officers at Dover AFB who have not attended the more lengthy course given previously and who cannot be spared from their regular duties for an extended period of time. Covering 12 hours of lectures and discussions, the special course which began in June is offered once each month. Under the direction of S/Sgt. Richard W. Strickler who holds a degree in education, the special course brings top-management talent to the Base to participate in the program.

Industrial College of the Armed Forces, Washington, D.C. The National Resources Conference is being presented in 16 cities again this year by a team of Army, Navy,

Marine and Air Force officers from the faculty of the Industrial College of the Armed Forces. Each Conference is a two-week session, 4 hours each day and 5 days a week, and is a condensation of the 10-month residence course given at the College. Civilian conferees are chosen by a local Civilian Selection Committee, and Army, Navy and Air Force Reserve Officers not on active duty may apply through official channels. The Industrial College is the only military school which is principally concerned with civilian economy and civilian-military relationships, and has been widely accepted by both civilian and military leaders.

Naval Air Station, Hutchinson, Kansas. Graduating in the largest class this year, 21 student officers recently received their "Navy Wings of Gold" and appointments as Ensigns in the Naval Reserve. The previous mark was 18 graduates set on June 26th and repeated again on June 30th. Ceremonies were held in the station Chapel, and presentations were made by Commander J. D. Adam, Executive Officer.

The Institute of Management Sciences, Associate Secretary, Professor Paul Kircher, BA University of California, Los Angeles 24, California. The Third Annual meeting of the Institute will be held October 18-19, 1956 in Los Angeles, and will again this year bring to the conferees a host of management information. Reservations may be obtained from the above address.

Reserve Officers Training Corps. Flight training for Army and Air Force ROTC students will begin this year, and ultimately will be offered at 180 Air Force and 40 Army institutions. The program will be conducted by CAA-approved civilian flight training schools at no expense to the student. Certification of instructors, flight checks and final qualifications also will be

administered by the CAA. Those who successfully complete the course will be qualified to apply for private pilot's licenses.

Army Aviation School, Fort Rucker, Alabama. Student enrollment has reached a new high with more than 1,000 students participating in the 18 courses offered at the school. A total of 557 students were enrolled in the various courses of instruction when Department of the Army designated the separate establishment of the Army Aviation School. Today, according to the latest tabulations, almost twice as many—1005—are presently receiving instruction. In the report, 1st Lieut. Paul Blackwell, school registrar, said the increase marks a gradual expansion of Army Aviation throughout the Army.

National War College, Washington, D.C. The eleventh Class started last month with 133 members, 34 from the Army, 27 from the Navy, 7 from the Marines, 34 from the Air Force, one from the Coast Guard and 30 civilians. The class will graduate 11 June 1957.

United States Air Force Academy, Denver, Colorado. Major General James E. Briggs, USAF, Superintendent, has announced the assignment of Colonel Robert F. McDermott, USAF, to be Dean of Faculty. Colonel McDermott has been a member of the faculty since the Academy's establishment, serving as Professor of Economics and Vice-Dean, and more recently as Secretary of the Faculty.

Marine Corps Recruit Depot, San Diego, California. Major General Thomas A. Wornham, USMC, assumed command of the Depot recently succeeding Brigadier General Alan Shapley, USMC, who has commanded the Depot, in addition to the Recruit Training Command, since the departure of Major General J. C. McQueen late in July. General Shapley has departed for Okinawa to take command of the 3d Marine Division.

Air War College, Maxwell Air Force Base, Alabama. Major General Robert F. Tate, USAF, has assumed command of the Air War College following three years as Air Force member, Joint Strategy

Survey Committee, Joint Chiefs of Staff, in Washington.

Naval Station, Newport, Rhode Island. Vice Admiral James L. Holmway Jr., Chief of Naval Personnel, was the principal speaker at the recent graduation exercises for 771 ensigns and lieutenants (jg) of the Regular Navy and Naval Reserve. 301 of the graduates received commissions in the Regular Navy and were former outstanding petty and warrant officers selected from thousands of applicants. The other 470 officers are all college graduates representing some 250 colleges and universities throughout the country. Captain Otto W. Spahr Jr., commanding officer of the Naval Schools Command, in a separate ceremony administered the oath of office to 17 women officer candidates sworn into the Navy as ensigns. Guest speaker for this oc-

casion was Captain John N. Shaffer of the Atlantic Fleet Destroyer Force.

Marine Corps Schools, Quantico, Virginia. Colonel William W. Buchanan has assumed duties as Director of Senior Schools relieving Colonel H. Nickerson who has gone to Headquarters Fleet Marine Force, Pacific in Pearl Harbor. This will be Colonel Buchanan's fourth tour of duty at Quantico.

Marquette University Management Center, Milwaukee, Wisconsin. The Human Relations Conference for Supervisors is being given in addition to their five-day course, every other Friday, October 26; November 9 and 23; and December 7th and 21st. This now makes attendance possible for those individuals in the area who could not attend during the five continuous days.



NEWS BRIEFS

from the

SERVICES

Naval Air Bases, 12th Naval District, NAS Alameda, California. Captain Frank Turner, USN, has assumed duties of Commander, Naval Air Bases, 12th Naval District, succeeding Rear Admiral A. B. Vosseller, who has retired. The new assignment is in addition to chief of staff, ComNab 12, commanding officer of the Alameda Naval Air Station, and district aviation officer to the 12ND commandant. Captain Turner, once commanding officer of the aircraft carrier ESSEX, brings a host of experience to the new assignment.

Air Force ROTC Headquarters, Maxwell Air Force Base, Alabama. Ten WAF officers have been assigned duty as Assistant Professors of Air Science at ten colleges and universities across the nation. This year, the ten educational institutions were selected on a trial basis to determine the feasibility of establishing a permanent Air Force ROTC program for women.

Headquarters First Army, Governors Island, New York. A pilot installation of a "super-Market" type of Supply Center for small

expendable Army supplies, the first in the eight-state First Army Area, is expected to be in operation at Fort Dix, N.J., within the next 60 days. Others are in prospect for Fort Totten, Fort Niagara, and Fort Wadsworth in New York State, and Fort Devens, Mass., by June 30, 1957.

Headquarters FMFPac, Oahu, Hawaii. Lt. Gen. Edwin A. Pollock, USMC, formerly Commandant of the Marine Corps Schools, Quantico, Virginia, has assumed command of Fleet Marine Force, Pacific. General Pollock relieved Gen. William O. Brice, USMC, who has retired and been promoted to four-star rank.

Naval Supply Depot, Great Lakes, Illinois. Captain H. F. Kuehl, USN, relieved Commander G. M. Driscoll, USN, as Commanding Officer of NSD. Captain Kuehl in his first official act during the change of command ceremonies swore Commander Driscoll in as Captain and pinned on his shoulder bars, making official his new rank.

Pentagon Heliport, Washington, D.C. An Army H-21 landed at the

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Pentagon Heliport last month 37 hours and 2610 miles from takeoff in San Diego, California, to complete the first nonstop transcontinental flight ever made by helicopter. Captain James E. Bowman piloted the 'copter and by inflight refueling proved the normal range of 300 miles could be extended to an indefinite quantity.

Coast Guard Cutter Escanaba, Curtis Bay, Maryland. Restored to the active fleet after two years in mothballs, the Coast Guard Cutter ESCANABA, will shortly join the Coast Guard's Atlantic Fleet and operate on ocean stations out of New Bedford, Mass. The 255-footer, a destroyer escort type, is commanded by Lt. Commander J. S. L. Kidd, USCG, and is intended to relieve the UNIMAK from ocean station service to Reserve training at Cape May Receiving Center.

United States Naval Academy, Annapolis, Maryland. Rear Admiral William R. Smedberg 3d, Academy Superintendent, is surveying Pensacola Naval Air Station facilities with a view toward training mid-

shipmen at the Air Station. Unfortunately, approval for a field at Annapolis has not as yet been secured, and midshipmen must presently receive air indoctrination in 20-year-old seaplanes referred to as "yellow perils."

Association of Military Surgeons, Washington, D.C. The 63rd Annual Meeting of the Association will be held at the Statler Hotel in Washington, November 12, 13, and 14th. Rear Admiral Winfred P. Dana, (MC) USN, President, reports this year's meeting will point up the growing responsibilities of medicine, and encourages all members to attend.

Alaskan Air Command, APO 937, Seattle, Washington. Major General Frank A. Armstrong, Jr., USAF, has assumed command of the Alaskan Air Command. Formerly Commander of the Second Air Force, Barksdale Air Force Base, Shreveport, Louisiana, (SAC), this represents General Armstrong's second tour of duty in Alaska.

Air Force Flight Test Center,

Edwards AFB, California. Colonel Horace A. Hanes, Director of Flight Test and Development, was last month presented the Mackay Trophy for 1955 by Air Force Chief of Staff General Nathan F. Twining. The award was made for the most meritorious flight of the year, when on 20 August 1955, Colonel Hanes established the then world's speed record of 822.135 miles per hour piloting an F-100C.

Army Signal Supply Agency, Philadelphia, Pennsylvania. A new giant electronic computer designed by the International Business Machine Corporation, has been placed in operation at the Signal Supply Agency. Capable of making 30,000 logistical decisions per second, the machine accounts for and controls the daily changing status of more than 150,000 items of signal communications equipment and supplies stored in depots in the United States and overseas. Information made available to the computer is memorized and stored on reels of magnetic tape. This stored data is continuously available and can be reproduced at electronic speeds.

Naval General Stores Supply Office, Philadelphia, Pennsylvania. Captain R. H. Northwood, USN, assumed command of the installation in colorful ceremonies recently at the Center. Coincidental with the ninth anniversary of the establishment of GSSO as a Supply Demand Control Point for General Stores Material in the Navy Supply System, hundreds of military and civilian guests attended the ceremony.

Perrin Air Force Base, Texas. A new usage of business machines is being proven at this installation. A new system of man-hour accounting has been placed in effect in the maintenance squadrons which work on the F86-D and the T-33. Maintenance personnel fill out their time cards, showing how much time was spent working on each component of the aircraft. The cards then go to the IBM section where they are tabulated and analyzed to determine why the aircraft is out of commission, what maintenance was performed and man-hours expended. In effect since 1 July, the new system of man-hour

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accounting has produced many improvements.

Quartermaster Research and Development Command, Natick, Mass. A recent two-day meeting with Department of Defense officials was held in the interests of cataloging and standardization programs affecting military supply items.

USS Bremerton, Long Beach, California. The heavy cruiser BREMERTON commanded by Captain Charles C. Kirkpatrick, USN, won the Pacific Fleet's annual Battle Efficiency Competition for Cruisers for the 1955-56 fiscal year. Rear Admiral Chester C. Wood, USN, commander, Cruiser-Destroyer Force, Pacific, in the announcement made in San Diego, stated the BREMERTON is now authorized to display the white "E", symbolic of battle efficiency and the green "E" for operational excellence.

Paris Island, South Carolina. 1st Lieut. William W. McMillan, USMC, recently took top-honors in the National Trophy pistol competition at Camp Perry, Ohio.

101st Airborne Division, Fort Campbell, Kentucky. General Maxwell D. Taylor, Army Chief of Staff, presented the colors to the Army's newest division on 21 September in the division's Organization Day review. General Taylor and General Sherburne were both in the WWII 101st Airborne Division.

USS Thetis Bay (CVHA-1), San Francisco Naval Shipyard, California. The Navy's first helicopter assault aircraft carrier was recently commissioned in colorful ceremonies in San Francisco. Extensively modified to operate helicopters exclusively and to accommodate 1000 combat-equipped Marines, the ship has joined the Pacific Fleet. As an aviation ship, it will be under the control of Vice Admiral Alfred M. Pride, ComAirPac; but will operate largely in its new mission under the operational control of Vice Admiral T. G. W. Settle, Commander, Amphibious Force, Pacific.

Air Materiel Command, Wright-Patterson AFB, Ohio. Brigadier General L. P. Dahl, USAF, has assumed duties as Comptroller of Air

Materiel Command. General Dahl in addition will serve as General Rawling's financial advisor, and administer the multi-billion dollar AMC budget. The General came to AMC from a three-year assignment as Commander of the Spain Air Materiel Area.

USS Ranger, Newport News Shipbuilding and Dry Dock Company, Virginia. In colorful ceremonies at the shipyard, the third Forrestal-class aircraft carrier, the RANGER, was launched on September 29th. The 1046-foot RANGER is equal in length to the SARATOGA which joined the fleet April 14, and several feet longer than the FORRESTAL which has been in service almost a year. The keel of the attack carrier was laid on August 2, 1954, and her launching 26 months later marks a new launching time record on this class carriers.

Eighth Coast Guard District, New Orleans, Louisiana. Rear Admiral Joseph Arthur Kerrins, USCG has assumed his new post as Commander, 8th Coast Guard District. Previously chief of staff and acting commander of the 12th Coast Guard District in San Francisco, Admiral Kerrins succeeds Captain Henry R. Stinchcomb, USCG who died in July.

Engineers' Military Construction Field Group, Washington, D.C. A famous small unit whose job is to see that the government receives a dollar's worth of military construction for every dollar spent, moved last month from Omaha, Nebraska to Washington, D.C. Established in June, 1952 the Group has inspected to date approximately \$66-billion worth of military construction.

Tactical Air Command, Langley AFB, Virginia. An Air Force B-66, developed for use by TAC, recently flew from Hawaii to Long Beach, California, 2690 miles at an average speed of more than 600 miles per hour. Piloted by Major Ralph R. Robinette, USAF, the Douglas built B-66, made the trip in 4 hours and 27 minutes.

Naval Avionics Facility, Indianapolis, Indiana. The former Naval Ordnance Plant, has assumed a new name and a new mission. Man-



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agement control has passed from BuOrd to BuAer will continue its mission of research, development and design in addition to production in fire control and related equipment, and now begin working in the guided missile field.

Lackland Air Force Base, Texas. The Commander's Award of \$25,000 cash and a permanent plaque was recently won by Lackland in the Air Training Command Ground Safety Contest. Ellington Air Force Base, Texas and Keesler Air Force Base, Mississippi, were second and third place winners respectively.

Richmond Quartermaster Depot, Richmond, Virginia. Major General A. B. Denniston, the Deputy Quartermaster General, presented to the Richmond Quartermaster Depot the National Safety Council's Award of Honor. During 1955 the Depot achieved a reduction of 51.41 per cent in the overall accident rate.

ARMED FORCES MANAGEMENT
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Labor Efficiency and Problems In Administering Wage Incentives

by Orville W. Roberts

Professor of Industrial Management,
Northwestern University

AN INDUSTRIAL manager is forever confronted with problems of how to raise the level of labor efficiency just as he is concerned with ways to get more and better production out of his plant's facilities. He looks upon his job with a sense of responsibility to make a profit while reducing costs and producing more and better goods so that more people may have a higher standard of living. He knows that great opportunities lie in the direction of greater labor efficiency for we tend to work at a 60% pace most of the time. He views the overall situation as Taylor did in his day. In his paper on "Principles of Scientific Management," F. W. Taylor said, "As yet, we have but vaguely appreciated the importance of the larger question of increasing our national efficiency." He declared his purpose was, "First, to point out—the great loss which the whole country is suffering through inefficiency in almost all of our daily acts."

Wage Incentives—the Way To Greater National Efficiency

So much has been said about man's love of money that it seems logical to believe that this great national loss can be avoided by inciting workers to higher levels of production and efficiency with more money — wage incentives. What about their effectiveness? Do wage incentives result in greater labor efficiency? One answer which seems typical, is contained in a report by a Government agency representative at Cornell University's Labor Relations Institute in 1946. It covered a survey of 514 companies selected at random. It claimed that wage incentives had increased production an average of 38.99%. In 173 of them, unit labor costs were reduced by 11.58%, and the workers took home 17.56% more pay. To what extent are wage incentives used in industry? "Sam-



pling surveys taken between 1922 and 1935 showed that from 43 to 46% of factory workers were on some form of wage incentive . . . By 1940, a survey indicated that 61.8% of the factory employees were on incentives . . . Of recent surveys, those taken by Professor Ralph M. Barnes in 1948 . . . the findings were as follows:

Percentage of Factories Using Incentives	92
Percentage of Direct Labor on Incentives	65
Percentage of Indirect Labor on Incentives	20

. . . The 1947 Survey of the National Metal Trades Association covering 687 member companies in the N. Y.-N. J. region . . . 50% were using wage incentives, while 3.3% had used them but had dropped the practice."¹ Most other wage incentive surveys made before and after 1948 seem to show about the same results as those cited above. Then why should anyone question their effectiveness? Are they not certain to increase production, lower costs, and increase wages? Some managers say, yes; others say no. And why is this so?

Wage Incentive Surveys Are Suspect

For one reason, the data are

¹Personnel Handbook, The Ronald Press, New York, 1951.

gathered, or analyzed, or reported by those who father incentive schemes; and some of their conclusions are drawn with considerable bias. Furthermore, they do not usually tell the whole truth. In most instances, other things, such as work simplification and process improvement, were done besides paying extra for extra production. Hence, "before" and "after" figures are not on a comparable basis. Cause and effect ratios when so computed and reported are misleading to management. And they leave an impression among workers or their representatives that the greater output reported was due primarily to greater labor efficiency. And managers at the bargaining table are too much inclined to agree that labor is entitled to all the savings or gains. Then too, the very nature of cost accounting would seem to preclude taking into consideration many of the costs that are rightly chargeable to the effectiveness of wage incentives. This is true of the less tangible costs, and to those real costs which are not determined or reported. For example, a certain foreman in a large Chicago factory said recently that about 90% of his workers' gripes were over the administration of their wage incentive plan. Anyone knows that assuaging gripes is costly. Some of them lead to dis-

putes that are resolved only after long and bitter strikes. In 1951, 14,500 steelworkers in one plant stopped production for eight days over workload matters involving the incentive plan.² If the average wage per man for the 8-day period may be estimated at \$120.00 and the labor cost at 1/5 of sales, then roughly \$8,700,000.00 of production was lost. It is doubtful that costs of this kind are taken into account when evaluating the incentive plans studied in the typical survey. A manager is justified in being skeptical of the results claimed.

Some Managers Have No Faith In Wage Incentives

Another reason why managers say no to wage incentive schemes may be found in their philosophies. Recently, in a Sunday school class of business and professional men the topic for discussion was based upon one of Jesus' parables. It is about certain laborers who waited variously long hours in the market place for someone to come in and hire them. A vineyardist did find them one by one and put them to work. Although they worked unequal hours, and less than a full day, they were all paid a dinarius, the same as paid to those who had toiled through the heat of the whole day. It might seem that this establishes the principle of equal pay for unequal work.

Maybe it does, for it is just what we do in straight day-rate plans. But Jesus was trying to get across the idea that whatever is received from God towards eternal life is a gift; it is not earned. He spoke from God's point of view. Most of the class however, being human, looked at the parable from man's point of view and sympathized with those laborers who had worked the whole day. They growled at the vineyardist for paying the idle ones as much as they received. Some of the class thought that this protest establishes the logics of paying in proportion to production as we do under incentive plans. The class turned to a discussion of wage incentives and the efficiency of labor.

The general manager of a num-

²From the Monthly Labor Review, May, 1952.

ber of small factories employing about 3,000 factory workers was among the first to comment. His remarks went something like this: "I don't see why we should be so anxious for people to work at 100% all of the time. Most of us are already running around like mad. Maybe we should look for ways to slow down; there'd be fewer ulcers. I think we've made a mistake in talking about incentives. That word gives the idea of 'speed-up,' and you know what most workers think of that. Instead of incentives, I like to think in terms of rewards." Something of the same philosophy was expressed by James F. Lincoln who said, "piece-work is not a scheme for compelling men to work harder and produce more—that can't be done to free men. It is for the sole purposes of giving management and the worker an accurate measure of the worker's efficiency."³ It appears that some managers just don't believe in the idea of inciting workers with money.

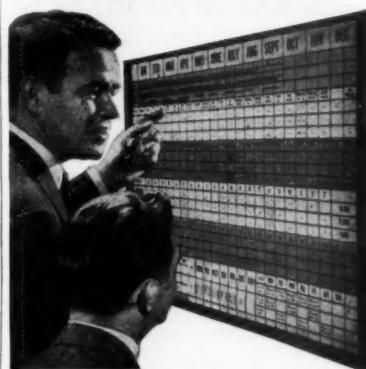
Higher Wage Rates As An Incentive

Many mature and experienced managers have concluded, as Frank Rising did, that money is not the great motivator that most of us would suppose. He said, "Productivity does seem to be related to politics, poverty, ambition, hunger, and sex. But it isn't related to wages. The amount of work we do seems to have no connection with the amount of pay we get."⁴ His view is supported by the now famous "Hawthorne Experiment." In a report of it we read, "The results from the different inquiries provide considerable material for the study of financial incentives. None of the results, however, gave the slightest substantiation to the theory that the worker is motivated by economic interest. The evidence indicated that the efficiency of a wage incentive is so dependent on its relation to other factors that it is impossible to separate it out as a thing of itself having an independent effect. The studies pro-

³Incentive Management, by James F. Lincoln, Lincoln Electric Co., Cleveland, Ohio, 1946.

⁴A Management View, A.M.A. Personnel Series No. 122, 1948.

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vided a number of situations in which the incentive wage had either lost its power to motivate or functioned differently than is frequently assumed.⁵ Is this not enough to justify any manager's doubt about the effectiveness of wage incentives as reported in so many surveys?

There have been seven or more rounds of wage increases since World War II and there is little evidence that these successive increments have appreciably increased the efficiency of industrial workers. In the General Motors-U.A.W. agreement there is an "annual improvement factor" which grants 4c per hour across the board per year for five years. This is to provide "a continuing improvement in the standard of living of employees." This factor "depends upon technological progress, better tools, methods, processes and equipment and a cooperative attitude on the part of all parties in such progress." Perhaps it is sig-

⁵Management and the Worker, by Roethlisberger and Dickson, Harvard University Press, Cambridge, Mass., 1947.

nificant that the "improvement factor" is to depend upon something other than greater labor efficiency. It seems that labor's contribution is to be a cooperative attitude which will allow technological factors to succeed!

Fringe Benefits As An Incentive

A generation or so ago, industrial managers were being urged by human engineers to grant vacations with pay on the theory that "it pays to do so." Absence from employment would freshen up the workers and they would return to their jobs with a zest for work that would soon make up lost production. Under a 6-day, 10-hour-per-day, workweek this belief was substantiated in many instances. But under a 40-hour workweek very little, if any, justification can be found. On the contrary, more production is lost while the workers review, and recover from, their vacations.

Now the thinking is that if vaca-

tions with pay are not granted, the worker's efficiency will fall off. This is the logic of all schemes that pay for time not worked—fringe wages. It is costly not to grant the fringe; so, it pays to pay! The U.S. Chamber of Commerce, August, 1954, reported on the extent of fringe benefits in 1953. It shows an increase of 13% in fringe costs since its survey in 1951, and concludes that, "American industry is currently spending on fringes nearly 20% of its annual payroll."

The cost is estimated at about 25 billion dollars a year. Fringe costs in a large company whose operating headquarters are in Chicago amounted to a little over 61¢ per man-hour worked in 1954; up 19¢ since 1951. A certain competitor's costs on a nearly comparable basis were about 72¢ per man-hour worked. In each case there was no evidence that any of the many kinds of fringe benefits had any effect on labor's efficiency. How is it that American industry can stand such non-productive costs? Could it be that this hungry-mouthed monster is being fed primarily from the ever-increasing efficiency of engineers and managers!

Counter Forces To Wage Incentives

There are many forces that tend to vitiate a wage incentive. They are present to some degree among all employed groups. The inhibitors include such traits as despondency, indisposition, cynicism and misanthropism. These traits arise from family troubles, social and economic problems, fear of working oneself out of a job, union anti-speedup policy, politically inspired hatred of business and management, grievances over standards and methods, satisfying base rates, lack of voice in management, lingering memories of rate cutting, or other malpractices in human relations too numerous to give in detail here.

It seems that a large majority of industrial workers take a dim view of Abe Lincoln's way of thinking about work and wages. He is reported to have said, "The man who does not do more than he is paid for isn't worth what he gets."⁸ And it is still too true that out in the

shop the Methods Engineer and the Industrial Engineer are just plain old blankety-blank efficiency experts! The attitude seems to be pretty well expressed by this little chuckle: Gertrude: "My husband is an efficiency expert!" Mable: "And just what does an efficiency expert do?" Gert: "Well I don't know exactly, but when I do it to him, he calls it nagging!"⁷

Closer Supervision As An Effective Means

There are managers who believe that a wage incentive plan is only a crutch for ineffective supervision. The best way to get labor's efficiency up is to boss it out of the gang! Gouldner tells of a case along this line in his recent book "Wildcat Strike."⁸ Under the old management regime, the workers were apt to say something like this, as one of them did to Mr. Gouldner: "I like it here. They don't push you around and they leave you alone. You know that's one of the reasons they pay so low around here.—The pay is like a balance for working conditions. It sort of balances things up." Later on the company was faced with tougher competition. A tough plant manager was hired to—"tighten things up; put the bit in the worker's mouth!" He was given orders to—"get production up." Ferdinand was one of the new bosses. He was "disposed to throw his weight around"—"ordering the men about in an impersonal and authoritarian way." He "generated close supervision which violated the workers' indulgency pattern."

After this "managerial retooling job" was done, a wildcat strike was generated. In the settlement of the strike, among other things, "(a) Ferdinand will be put in charge of mine development, air and water problems, etc. (b) he will not be in charge of a production gang." And that was the end of Ferdinand's interference with the workers' indulgency pattern!

Managerial Indulgencies and Effectiveness of Incentives

Indeed, perhaps the most insidi-

⁷Public Speaker's Treasure Chest, Prochnow, Harper and Bros., N.Y., 1942.

⁸Wildcat Strike, Alvin W. Gouldner, Antioch Press, Yellow Springs, Ohio, 1954.



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ous dissipator of all efforts to reach and maintain a high rate of labor efficiency are the indulgencies that creep into worker-management relationships. They arise, for example, over allowances made in computing standard times because of liberal interpretations of such terms as "acts of God," "beyond the employee's control," "substantial change in method or process," and "emergency." Fair and reasonable standards are loosened up as a result; and employees, fearful of the consequences of "running away with the rate," restrict their output, and management's indulgencies become labor's entrenched expectations.

Other indulgencies have to do with the administration of incentive plans. They are the seemingly insignificant changes in tools, machines, materials, methods, or processes that may be informally adopted. Their cumulative effect would justify a revision of the standard. Yet, because of an indulgent or tolerant supervisor, the standard continues unchanged. An instance of this kind occurred in a steel mill when the drive motor on one of the bloomer mills had to be replaced. The work order was treated as a routine maintenance job not involving the methods department.

But the new motor was of sufficiently greater horsepower to appreciably increase the machine's output. As a consequence, the bloom roller's earnings went from about \$33.00 per day to about \$39.00 with almost no additional effort or efficiency on his part. This wage increase was an illegitimate one. If allowed to stand it would become an entrenched expectancy. Actually, by devious methods, the mill's attainable output was restricted to the old standard rate of production to keep from "running away with the rate." And this situation was tolerated by management to avoid the necessity of dealing with the wage inequities that probably would have been claimed.

Other indulgencies result from many kinds of seemingly insignificant permissions granted by overly sympathetic and liberal supervisors. They too are illegitimate because they are granted outside the authorized system of wage control or the "legal" collective bargaining

process. They include such items as leaving work early or returning to work late for personal and inexcusable reasons, self-help to small parts and supplies for personal use, gathering at windows to see parades, loitering in rest rooms to smoke or to chew the fat, doing "government work" for themselves or for the boss, and tolerating inexcusable sub-standard performance.

They become a manner of living in the shop and are expected. They are very costly to get rid of; their consequences are rightly chargeable to the efficiency of labor, though management is guilty of permitting such non-productive acts.

There appeared on the editorial page of the Chicago Daily News, August 18, 1954, a letter from a certain Mr. R. M. Markwell as follows: "Last Saturday, while discussing with a recently retired banker the settlement of the Studebaker wage problem, he made the following observation: 'Of course, everyone is happy when a union and a large company cooperate in a clutch to save the skin of all concerned. But what is not being commented upon at this time is the earlier union pressure and management weakness that combined to place the company in an impossible competitive situation.' We were both surprised that your short editorial did not comment on the cause of the trouble." It is perhaps a good guess that the editor didn't know the cause of the trouble. Neither does this writer. But if there is any substance to the retired banker's comment one might suspect that indulgencies were among the causes. It would seem so for the reported 14% reduction in wages was achieved by dropping the incentive wage plan.

Further substantiation of this guess is an Associated Press item

● Montgomery Ward (Chicago, Ill.), has established a word guide to be used as part of the merit-rating procedure. Words commonly used to appraise people are given simple, effective definitions so that all supervisors over a period time are "meaning" the same thing for the same words. *Employee Relations Bulletin* 8-28-56 — *National Foremen's Institute*.

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in the Chicago Daily News under the date line South Bend, Indiana, January 21, 1955 as follows: "Studebaker workers have voted (7,188 to 806) to arm their committee with strike authorization power in a dispute over production methods." But regardless of whether or not the above assumptions are valid it is true that indulgency patterns can negate the effectiveness of wage incentives.

Production Bogies As Incentives

Some managers believe that the mere existence of a standard will serve as an incentive. That there is a grain of truth in this can not be denied. Par in golf is indeed a challenger and most everyone who plays the game tries to equal or better it if he can. But playing golf is not the same as working in a factory. A production "bogey" is not enough to incite workers to maintain the pace. Whatever incentive there is initially soon wears off after it has been demonstrated that the standard can be made or beat.

Those who have had experience with measured day-work plans know that "other things" must be featured to serve as motivators, such as up-grading and promotion, another step in the wage bracket, reclassification, for example.

Savings Sharing— An Illogical Expectancy

In earlier days, wage incentive plans were based upon past performance data rather than carefully engineered standards. Because of this, labor's ingenuity and efficiency played a large part in raising productivity levels. If there is any period in history when workers were entitled to 100% sharing it was in those early years. Yet partial sharing was most common.

Now, since labor plays such a minor part in greater productivity some sort of partial sharing plan would seem to be justified. The reverse is true. Management is confronted with the firmly entrenched expectancy that labor's share shall be 100%, or more; never less. In the absence of a finer and more comprehensive cost and efficiency analysis, management is unable to isolate and measure labor's contribution. Consequently, the degree of sharing for incentive pur-

Whirly-Birds May House TV Stations

Helicopters—the intrepid "whirly birds" of numerous military and civilian rescue missions—now may become self-contained flying television stations during major naval operations, it was announced.

Developed at Philco Corporation's Government & Industrial Division for the Navy Department's Bureau of Ships, a new airborne TV system is said to provide excellent operation over line-of-sight distances of more than fifty miles. Systems of this type could be used by the Navy for control of amphibious landings.

The system, an ultra-high frequency FM radio television link, provides for transmission, reception and display of TV information from the air to surface ships, or ground installations. During recent tests with the fleet, the Navy reported that excellent pictures were obtained of all phases of ship-to-shore movement, even before sunrise.

poses has an illogical base in the collective bargaining process. And the effectiveness of the wage incentive remains a matter of doubt. What, then, is the way to greater labor efficiency?

A Way To Greater Labor Efficiency

From what has been said up to this point perhaps a conclusion may be drawn. The way to greater labor efficiency is not a simple one; it is highly complex. There are many sign posts and devious routes. There are mirages on the way; detours are often inviting. The way is not narrow and it isn't straight. It seems that there are at least four pages in our road map for reference. The first requires managers to be exemplary.

This is a primary law of leadership. Workers are not inclined to work at their jobs more efficiently than managers perform their functions. Managerial efficiency is measurable in terms of organization, coordination, and control, and their subfunctions. These are the basic tools of management and there is, for each, a one best way of use. Let no manager be fooled; workers have a well developed sense of management's efficiency in their use. The second page of reference deals with the assignment of duties and responsibilities. Here we see the necessity of instructing, demonstrating, practicing, and testing until there is certainty that the employee knows and understands what is expected of him. Whatever is required must be fair, reasonable, and attainable as determined by sound engineering and human relations practices. This calls for training in its broadest and deepest sense and supervision in its fullest meaning. The third page deals with the managerial function of accountability. It is the discipline of responsibility. Performance has to be measured in terms of quality, quantity and time schedules.

The worker must be made aware of the degree of his success or failure, and that management knows the degree too. This requires a system of inspecting and accounting, recording and reporting together with an acceptable technique for calling people to judgment.

The fourth page is concerned with compensation. The expectancies of workers will have to be met. They are economic, social, and spiritual in nature. Economic ones may mean a higher base rate, a larger share of productivity increments, a new fringe wage, job security or other forms of direct and indirect financial benefits. Social ones may mean greater recognition and higher status, a voice in determining what their conditions of employment shall be, and other humane treatments. Spiritual expectancies are not readily identifiable or defined. We now refer to them as intangible.

But they are real, for they stem from the third and highest nature of man. The next great advance in the science of management will be in the field of "spiritual engineering". It has already shown the greatest promise of developing the will to work. The effectiveness of negative rewards ought not be overlooked though they are the least preferred. For, while religious doctrines on heaven and hell are not to be argued here, it is an established principle of human behavior that penalties, when justly applied, are effective. They motivate in two directions, namely, to *do* that which is right, and to *not do* that which is wrong. The same is true of positive rewards.

Finally, the effectiveness of wage incentives is dependent upon "other things." A delicate blending of all ingredients is necessary. That is why the way is complex. But to whatever level of efficiency the managers attain in following the foregoing outline of a way to greater labor efficiency just so high will be the ceiling of labor's efficiency in any given business enterprise.

Bigger Nest

Increased versatility in manufacturing and modification work will result from the construction of a new 8-plane modification building at the Georgia Division of Lockheed. Work done on the ramps in all kinds of weather will be moved inside when the building is completed November 15, 1956. Cost: about \$700,000.

THE ELECTRICAL accounting machine revolution in the Air Materiel Command, came naturally, and grew steadily as an "oak". The revolution was not an event or series of events of violence, rebellion, or uprising, but rather a series of gradual changes which have led to progress, efficiency, and more rapid processing of administrative work of the command.

It is the purpose of this paper to describe in general terms the extensive use of electrical accounting machines in the Air Materiel Command. The first portion of the paper will deal with some of the basic fundamentals of mechanization and will aid the reader to understand the mechanical revolution that occurred in the Air Materiel Command.

Let us first establish "What is mechanization or what is machine

THE ELECTRICAL ACCOUNTING MACHINE REVOLUTION

by Lt. Colonel Robert J. Brooks, USAF

processing?". A simple example will point out the major role of electric accounting machines (EAM's). A business man, manager, or supervisor requires summary information or facts to successfully render decisions, conduct day-to-day business, and to make sound plans for tomorrow. Ideally, the business man could feed large numbers of letters, reports, charts, and other mediums of data into a single machine or device. By pushing a button the mechanism would be required to add, subtract, multiply, and divide various variables. Additionally, the device could be commanded to print reports combining the variables in a variety of ways and combinations. To date science and industry have not given the business man such an accessory; however, through the medium of punch cards and electrical accounting machines the above named tasks can be performed.

The term punch cards is derived from the method of placing or storing data into the common medium. The data is placed into the cards

"Revolutions are not made, they come.

A revolution is as natural a growth as an oak.

It comes out of the past.

Its foundations are laid far back."

Wendell Phillips

through a series of holes punched directly in the card. An EAM system utilizes punch cards, three by eight inches, to convey data from a wide variety of sources to electrical accounting machines; the EAM's in turn are capable of performing the add-subtract-multiply-divide operation and printing the results in report format. In other words an EAM system uses punched cards to convey data to electrical devices for mathematical computations and subsequent report printing.

Two important questions always arise when the subject of mechanization is encountered. They are: "Can all reports, data, and information be processed by electrical accounting machines, and is mechanization always the more

economical manner of processing data?". Let us examine each in detail. The first, "processing all data by electrical accounting machines", can be quickly answered in the negative. The major limitation to punch card accounting is the amount of data that can be stored or punched in the processing medium—the punch card. On a single card there are only eighty columns available for data storage or display. This limitation means that if we wish to store five digits we are limited to sixteen sets of figures or alpha spaces. To overcome this limitation various codes are employed to save space or columns; the use of more than one card for particular entries also facilitates additional storage capacity. Yet in the Air Materiel Command today, there are a large number of manual tasks that cannot be converted to mechanical processing due to size or volume of the data, lack of flexibility of data, and complexity of statistical information.

The second question that arises, "is mechanical processing more

economical?", cannot be answered so easily as the first question. Generally speaking, the answer is also negative. The economies of mechanical processing are derived from speed of handling data, repetitive use of the same variables of data, and in the variety of reports produced from the mechanical computations. The major costs of an electrical accounting machine system are found in the card punching operation. This simple, yet laborious step of mechanization, is the operation of placing the data into the card mediums. More simply stated this is punching the holes in the cards that represent the figures or letters taken from the source document. Once the holes are in the punch card, there is almost no limit to the number of times the holes can be "read" and used in mathematical combinations. A system that does not use the punch cards to the maximum extent will not provide the efficiencies and economies of a system that finds multi-use for the punch card data. A general rule in the EAM business is "Never use the EAM's to do a typewriter's work".

One additional question that arises is worthy of consideration; that is, "What is the difference between bookkeeping machines and accounting machines?" The bookkeeping machines of today do not utilize punch cards or other medium for performing mathematical computations. Source data is operator fed into the bookkeeping device by key strokes or other mechanical means. As explained above the electrical accounting machines are fed data through use of the punch cards. In a large number of cases, both types of equipment are capable of performing the same mechanical computations and printing processed data in report forms, however operator stimuli must be used each time a bookkeeping machine performs computations. Again, a general rule of mechanization will serve as a summary of this point: "If the data will be repeated over and over—use punch cards—if data is to be processed one or a few times use bookkeeping machines".

Two major business enterprises design and manufacture electrical accounting machine equipment:

International Business Machines Corporation and Remington Rand Company. The equipment of both companies is quite similar and the mechanical products of the equipment are identical. It is interesting to note that the holes punched in the cards of the IBM equipment are square, where the holes in the RR cards are round.

A more striking difference is found in the policies of the two companies. IBM Corporation, the pioneer in the field, has a rigid policy on EAM usage; traditionally the equipment is secured through rental and service agreements. The company policy does not permit outright sale of EAM's. On the other hand, RR Company follows a more liberal policy which allows for machine use by either rental agreement or outright purchase. The installation, maintenance and servicing of EAM's is normally a part of the rental or purchase contract of each company.

At first thought it would appear more economical to purchase equipment than to rent. The old adage "why rent when you can buy a home?" would seem to hold. However, there is only one outstanding advantage to purchasing the equipment: in the long run purchase costs are substantially lower than rental cost. This advantage is quite heavily offset by the disadvantage of inability to replace older and out-moded equipment with newer, more efficient machines. Over the past nine years both companies have made tremendous technological advancements in machine speed, capability and efficiencies. Governmental or private enterprises owning EAM machines have not been able to take advantage of the newer models announced by the equipment companies. Those agencies using rental equipment have been able to convert to the more efficient, modern devices and have experienced offsetting monetary savings from the conversions.

The Air Materiel Command has followed a combined policy concerning rental or purchase. In the summer of 1954, a comprehensive study disclosed it was more economical to salvage all government owned Remington Rand EAM's and convert to modern highspeed,

flexible, and accurate rental equipment. The RR EAM's at AMC are now provided under rental agreement with the company.

Competition in the American economy is considered healthy and provides progress and advancement. In the electrical accounting machine field competition between the two rival companies, RR and IBM, did not flourish during post WW II years. IBM Corporation, the pioneer, exerted its research, production, and marketing efforts toward acquiring a "lion's share" of governmental business. Until 1953, the competitor seemed satisfied to exert his effort toward marketing EAM equipment to small business enterprises. However, in 1953, the RR Company turned its research, production, and sales forces toward governmental agencies with the hopes of capturing a share of the rental market. The Remington Rand EAM equipment was designed to meet government agencies usage, where previously it had not been specifically designed for government use. In many cases previous private industry equipment could not readily be used in federal offices.

Although the post-1953 equipment of RR in many respects was superior to IBM, the AMC found it was unable to take advantage of the competitor's achievements. This was due to equipment incompatibility. An industrial or EAM revolution had taken place between 1946-1952. In this time period a large number of AMC manual systems for reporting and management had been converted to punch card accounting systems which utilized IBM EAM's for processing. Not only had whole systems been mechanized, but cross-servicing of systems had become the rule rather than the exception. A large majority of these systems were not confined to the command headquarters operations, but were linked to lower echelon supply and specialized depots reporting and management systems which also used IBM equipment.

Studies conducted to determine the use of the more efficient RR equipment disclosed that although better accuracy and speed could be attained with the RR equipment, it could not be used to re-

place large numbers of IBM accounting machines in the command headquarters and in the depots. Not only were the machines incompatible, the dollar costs of conversions were prohibitive. Current inventories of accounting machine equipment in AMC reveals less than fifty pieces of RR machines to about two thousand pieces of IBM equipment. It appears that the rival company waited too long before endeavoring to establish a market in the Air Materiel Command.

Striking parallel to the Industrial Revolution of 1760-1790 is found in modern Air Force history. The period 1945 to 1954 has been described by some Air Force spokesmen as the period of electrical accounting machine revolution or the mechanization revolution. Again, a more careful study of events discloses the adoption of machine techniques in the Air Materiel Command and the Air Force to be one of gradual, step-by-step change to more economical and efficient machine processing methods of accomplishing laborious manual administrative tasks.

The mechanization revolution of the Air Service Command, the predecessor to the current Air Materiel Command, began in 1940 with the installation of rental IBM electrical accounting machines for the processing of personnel, aircraft flying time, fuel and oil, and simple material reports. During the war years, the mechanization trend at AMC increased at a rapid pace, and at the close of WW II, the EAM facilities employed about 180 machines and 500 employees at the command headquarters.

Electrical accounting machines were introduced to Air Force depots and specialized maintenance depots during 1943-1944. The original installations were engaged in mechanized reporting similar to that of the command headquarters; additionally, the machines were used to furnish local depot management with reports concerning depot operations.

In late 1948 and early 1949, a project that was to have a vital influence upon the command machine installations was service-tested. This project, Project WISE, was a further logical step in the

natural trend to increase mechanization. Prior to the service test of Project WISE, depot stock records, shipping data, warehouse data and consumption records had been maintained by manual and book-keeping machine methods. WISE introduced EAM's to the depot supply operation 100%. The service test was conducted for a year at a major Air Force depot. The EAM operations provided large savings in manpower, more accurate records, faster supply actions, and additional management data. The decision was made to mechanize all AMC depots in 1949.

Depots were phased into the mechanized WISE system over about eighteen months time, but the outbreak of hostilities in Korea found AMC in the midst of the conversion program. The activities associated with the Korean mobilization accelerated the implementation of EAM's in the depots and equipment and personnel were added at an accelerated rate. By 1953 all Air Force depots had converted to the WISE mechanization system.

With the installation of larger machine units at the lower echelons of Air Materiel Command, the machine organization at the headquarters required enlargement to facilitate the processing of incoming management data. This data was forwarded by the depots to the command headquarters in the form of punch cards. Prior to the close of the Korean War the Statistical Services Division at AMC was utilizing approximately 700 people and about 300 EAM's.

With the ending of the war, the long hands of demobilization and austerity again appeared in the form of reduced personnel authorizations and tightening of the budget purse strings. As in the demobilization period of 1946-1949, the

● A recent survey by Paper Cup and Container Institute showed that the 15-minute and hour lunch periods are fast giving way to a standard half-hour lunch period. An Institute survey in 1950 showed 69% of the plants had half-hour lunch periods. But, by 1955, the figure had risen to more than 82%. —From article in *Inplant Food Management*.

machine installations again felt the personnel and dollars squeeze. History was repeating, for with overall command austerity, management was seeking out more efficient methods for administration. Machine accounting offered increased capabilities for less dollars and fewer personnel. The command statistical organizations released excess EAM equipment and utilized second and third shifts on the EAM's to meet the increased workload. Personnel losses were offset by greater operator proficiency and productivity; operator skill was at a premium.

As the "bugs" and deficiencies of mechanized systems associated with supply and services functions of the depots were worked out and the systems began to "pay-off" in efficiencies and time savings, other depot functions were seeking out the services of the electrical accounting machine organizations. The mechanization of selected maintenance, procurement, and accounting functions were natural and expedient avenues for application of machine techniques. It was found that the punch cards used in the various supply operations offered many by-products that could be cross-referenced or cross-serviced into maintenance, procurement, and accounting systems. The years 1950 to 1952 saw more extensive use of electrical accounting machines in the AMC depots. To a large degree the number of EAM's remained fixed, and the increased products were made available through use of extra machine shifts.

A command decision in 1952 to decentralize headquarters operations and functions required the shifting of large volumes of work and tasks from the headquarters to the field installations or Air Force depots. The decision resulted in shifting of EAM's and personnel from the headquarters statistical organization to depot organizations. By 1953 decentralization had been completed and depot machine units reached sizes never before approached. San Antonio Air Materiel Area, Texas continued to have the largest EAM installation of the fifteen depots. In the way of magnitude this installation reached the size of 200 EAM's and about 500 personnel; dollars-wise rental budg.

et for EAM's for the Texas installation was about \$800,000 in 1954.

Mechanization in the Air Materiel Command is "big business" and the size of EAM operations may be visualized from the 1955 Budget statistics appearing below.

Item	Headquarters Depots	
Annual Rental for EAM's	\$605,000	\$6,600,000
Number of EAM's	200	2,050
Number of Employees	585	3,805
USAF officers	10	20
USAF airmen	50	200
Civilians (Civil Service)	525	3,585

Economists have established the theory that "big business" can achieve only so much *bigness*—then a point of diminishing returns is encountered. This fact or theory seems to be a truism with the electrical accounting machine field. The IBM installation at AMC is reported to be the largest EAM installation in the government. Yet, this organization has reached a point where additional mechanized workloads cannot be undertaken without losses in economy and efficiencies. Similar situations have developed in the large depots of the command. The point of diminishing returns in the case of mechanization appears to be saturation of the equipment in volume, complexity, and pressure for timeliness and accuracy of data. Although, EAM's have increased the overall speed of administration throughout the command, the necessity for more timely and accurate data for the management of the vast Air Force supply inventories, the \$8.9 billion dollar budget of AMC, the procurement and production contract administration of the AF, and the Congressionally desired monetary property accounting data cannot be accomplished through use of current electrical accounting machines available to the Air Force. This lack of capacity or capability was recognized as early as 1952, and the AMC embarked upon acquiring modern electronic computer equipment that could meet the needs of AMC management.

Science and industry have produced two types of electronic devices that have the speed, capacity, and flexibility desired for process-

ing logistical and material data of the Air Force command. One is the digital or analogue computer and the other is called a memory device or "Material Information Flow Device" (MIFD). The leaders in the electric accounting machine field are the major producers of computer equipment; IBM produces a memory drum device known as the Type 702. However, the computer field is led by Remington Rand; this company's UNIVAC is the outstanding computer in existence today. AMC elected in 1954 to install a UNIVAC, and the computer was put into operation at the command headquarters in September 1954. UNIVAC has already proven that many of the deficiencies of EAM operations will be overcome by the more speedy and flexible Remington Rand computer.

The other major type of computer is similar in function to the analogue computer, but performs its operations on less complex data problems. The AMC and Air Research Development Command have developed the specifications for a computer to be tried by the Air Force. The computer project established the name of the device as Material Information Flow Device (MIFD) and is currently planned for use in the major depots of AMC. Currently two pieces of equipment are being service-tested in AMC depots; one is manufactured by Monroe Calculating Company and is called MIFD-1; the other, the Electronic Data Pro-

Temp-resistant Paint Developed by Army Engineers

A new and unique high temperature resistant paint has been developed at the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Va. Designed primarily for field application for the protection of diesel engine exhaust systems, it has proved to be even more satisfactory for plant application.

Senior Project Engineer, Emil J. York, states that the paint can be applied by either brush or spray and will air dry to handle within one hour. In its air-dried state, it provides excellent protection from rust and corrosion and after complete curing the protection afforded is unlimited.

cessing Machine, Type 705, is manufactured by International Business Machines Corporation. The primary purpose of these devices is to solve, almost instantaneously, supply inventory problems and problems associated with requisitioning and shipping of Air Force materials and equipment between depots and air bases.

The installation of the more modern electronic computers and memory devices caused grave concern among EAM personnel of the AMC. Many felt the transition to computers and drums would be like the American transition from the horse and buggy to the automobile—there would be no need for the buggy or the electrical accounting machines. However, closer examination of the newer equipment methodology and systems, discloses that both devices are, at least temporarily, dependent upon data derived from the various and numerous mechanized systems of the command. It appears that the requirement for EAM's will remain for many years, and that the latest electronic equipment is merely a *college graduate* EAM that has been given a *graduate degree in calculus*.

In retrospect, one finds the industrial revolution in electrical accounting machines in the Air Materiel Command began in 1940; with World War II and the Korean War, the process of converting from manual to machine methods provided management the efficiencies, economies, and speed-ups required to keep pace with the ever growing logistical needs of the Air Force. By 1952, a short twelve years after the beginning of the revolution, the jet-age accompanied by rapid air logistics support concepts antiquated electrical accounting machine processing. Perhaps, it is more accurate to say, the jet-age and rapid air logistics stimulated requirements for machines or devices with larger mathematical capacities, higher speeds, and more accurate products or reports. It now appears, the analogue or digital computer offers a solution to the newborn requirements, but one must await the results of time. Perhaps, the electronic computer is only another step in the gradual revolution from manual operations to scientific processing.

Ryan Awarded Navy Contract For Helicopter Device

A new Ryan electronics device will help Navy hunter-killer helicopter-aircraft teams protect America's shores and ships against possible marauding enemy submarines.

Ryan Aeronautical Company has been awarded a new contract by the Navy Bureau of Aeronautics to build an advanced helicopter hovering detector suitable for production, T. Claude Ryan, company president, announced today. The contract represents the latest step forward in a company-sponsored helicopter instrumentation program which began two years ago.

The new hovering detector, designated AN/APN-97 (XN-2), will be miniaturized and lightened through substitution of transistors for vacuum tubes. As a result of operational requirements which came to light during Navy and the helicopter manufacturer's tests of its predecessor—Ryan's AN/APN-97 (XN-1)—the XN-2 model will provide additional electrical outputs for more fully automatic operation of helicopters.

The hovering device is an outgrowth of Ryan's AN/APN-67 automatic navigator, which is in production under a recently awarded \$5 million Navy contract. The navigation system has already been used in two major Navy projects—Rear Admiral Byrd's "Expedition Deepfreeze" to the Antarctic and "Project Magnet", which is measuring the direction and intensity of the earth's magnetic field.

Narrow Fabrics Manufacturers Complete Organization

At a 3-day meeting at The Drake Hotel, Chicago, a group of leading manufacturers completed formation of an industry organization to be known as the Narrow Fabrics Institute, Inc.

Mr. John Pepper, Assistant General Manager, Buffalo Weaving and Belting, was elected Chairman of the Board; Mr. Russell J. Neff, Assistant to the President, Phoenix Trimming Co., was elected President. Headquarters have been established at 11 West 42nd Street in New York City and the Institute will be managed by the firm of Penn Affiliates.

The major objective of the new

organization will be to consider and deal with common intra industry problems and to foster and further, in every lawful manner, the interests of the manufacturers and distributors of narrow fabrics and allied products and supplies.

Voting membership is available to any person, firm or corporation actively engaged in the manufacture of narrow fabrics products.

Associate membership is available to any person, firm or corporation whose principal business consists of buying and selling narrow fabrics for his own account.

In order to more effectively accomplish these objectives, formation of two separate product sections has been authorized by the Board; the one a Webbing Section, and the other, a Tape Section.

Air Conditioned Cabs Saves Guided Missile Transport

Installation of air conditioning in tractor cabs is saving a full day's driving time transporting Regulus guided missiles and other urgent cargo from the Chance Vought Aircraft plant at Dallas, Texas, to Edwards Air Force Base, 100 miles northeast of Los Angeles, California, an aircraft company executive disclosed recently.

Chance Vought's Manager of Traffic and Transportation, Grant Bunnell, announced that beginning last summer—when the company equipped some of its tractor cabs with a Dallas-manufactured air conditioning unit called Frigikab—the rugged 1,443-mile, cross-country trip has been cut from five to four days. This time-saving, according to Bunnell, represents a saving alone in operational cost of between fifty and sixty dollars per trip.

"The time conserved in making urgent cross-country deliveries is, of course, as important to us as the saving in cost", Bunnell said.

"The fact remains that we are saving enough on purely operational costs—not figuring in depreciation—to amortize the cost of an Frigikab air conditioner in about five trips to the coast", he added.

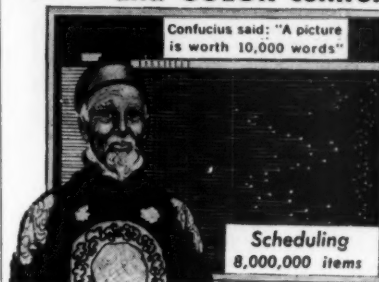
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entirely possible, according to Dr. Allen B. Du Mont, Chairman of Allen B. Du Mont Laboratories, Inc. Dr. Du Mont has just returned from a television survey trip in the Caribbean area and South America.

"It is in the realm of probability that in a few years," Dr. Du Mont said, "live coverage of the World Series will be carried in many Latin American countries. Venezuelans, for example, are tremendously enthusiastic followers of American baseball and know the players and batting averages.

"For live U.S. television to reach Venezuela, 'forward scatter' facilities between Florida and Cuba would be used. The television signal could then be transmitted on present facilities to Santiago de Cuba at the other end of the island.

"The blank spot at the present time is the island of Haiti. However, if a receiving station and beam transmitter were established on the 9,000 foot mountain near Port-au-Prince, I believe that usable signals could be received in Venezuela."



By Dr. Donald W. Cox

*Educational Adviser
Squadron Officer School
Air Command and Staff College
Air University
Maxwell Air Force Base, Alabama*

TO ADEQUATELY understand the growing complexities of the onrushing air age, we are too often mesmerized by the technological improvements such as the speed and grace of the sleek new supersonic aircraft and the configurations of guided missiles, at the expense of the human element. But the human element is actually more important than the speed and range of aircraft, particularly the leadership of the human element.

Generals Spaatz, Kuter and Lindbergh are three Air Force leaders who have long recognized this truth—on the superiority of man over machines—and have put their feeling on the matter of the human element being most important in writing. Recently, another Air Force Brigadier General, Cecil E. Combs, wrote an analysis of the relationship between man and machine where he singled out "why" the former is so much more significant than the latter, as far as the future of the Air Force is concerned. "Some people assume," General Combs wrote, "that the versatility and effectiveness of modern machines have reduced the importance of the individual in warfare. The opposite is true, particularly in today's Air Force. When technical equipments enable one man to do what was formerly the work of many men, the responsibility which once fell on the leader of many men then rests on the shoulders of the one man who controls the machine. The destructive force of a large flight of heavy bombers in World War II was entrusted only to a senior, proven commander.

Subordinates can be Leaders too!

Nowadays an even greater force may be put in the hands of a single crew or a single individual who becomes ultimately responsible for the disposition of this force. In short, the greater the complexity of the machine and the greater the military value of the weapon, the greater the responsible leadership required of the individual officer."

If the human element, particularly subordinates, are as important as the above erstwhile authority says it is, then it behooves us to take a closer scrutiny of the duties and job functions of leaders and subordinates, so as to better appreciate the change to a shared leadership situation in the Air Force.

For technology has finally caught up with the social structure in the military, particularly the Air Force. The traditional belief of leadership as a collection of an outstanding set of fixed traits and characteristics in an individual officer finally began to wane during the latter part of World War II, according to Dr. Saul Sells, research psychologist of the School of Aviation Medicine of the Air University. This traditional concept of leadership has been slowly giving way to a newer, dynamic concept of "shared" leadership, brought about to the complexities of the air age, where no one man knows all there is to know about how to run his unit of command. Instead, he must increasingly rely on technical specialists (both officers and enlisted men) to help him out with the burdens of successfully completing his mission.

In this respect, traits and char-

acteristics possessed by any one person do not apply equally to all the leadership situations in which he is apt to find himself. The mystical belief in leadership being centered predominantly around certain human characteristics (such as initiative, courage, integrity, emotional stability, self-confidence, etc.) rather than situations has beclouded the true nature of Air Force leadership today. For instance, traits which are effective in commanding an Air Force wing may not always work in a POW camp ("enthusiasm" may work fine in one of the situations but not in the other). These changing situations usually offer opportunities for subordinates to assume leadership roles.

Count Wolf Baudissin writing on "The New German Army" in a recent issue of *Foreign Affairs* has this to say about the changed view of the relation between the leader and the led in a modern democratic military situation: "Traditional ways also fail in the face of technical progress in-so-far as concepts of military authority and soldierly obedience derive from the world of patriarchal feudalism. The range, speed, and complication of military operations in the age of motor and radio, and the variety and complexity of weapons and equipment have left their mark on the military social structure. The tactical and technical specialist has taken his place as an equal in importance alongside the tactical leader. Through the interlocking and far-reaching possibilities of air reconnaissance and radio, the mod-

ern leader controls his unit as completely as the fencer his rapier. But he must realize that mere subordination can accomplish little. Success will depend upon mutual confidence, latitude in orders and delegation of initiative to the lower echelons. The "melting" of the superior into the group (or rather the raising of the subordinates) becomes particularly evident in the airplane, tank, or submarine. The superior ranks above his subordinate for purposes of coordination, but since he usually is less well equipped in special knowledge he is restricted to that one special function. In other words, he has to rely on the cooperation of his subordinates in thinking and acting just as much as they rely on him for leadership. These new social conditions in motorized and armored units, in the air arm and in submarines produced attitudes and codes during the war which come far closer to the concept of a free community based on mutual partnership than to the traditional picture of patriarchal authority over "minors." (This new concept is a far cry from Hitler's ideas of military leadership as propounded by the Nazi hierarchy in World War II.)

What Count Von Baudissin so ably summed up concerning the major change in military leadership relations during the last decade, due mainly to the growing complexities and importance of technological equipment needed to run the armed services effectively, was also mirrored in the recent reflections of a member of the successful Everest expedition. Although the conquest of Mt. Everest was brought about by a non-military force, it was run along military lines. The "formal" leader of the successful British climbing party in the spring of 1953 was Brigadier (later Sir John) Hunt who organized the trek with military planning and organizational efficiency, which no doubt aided the climbers in their quest to successfully complete their mission. But not all the members of the expedition looked upon the assigned leadership aspects of climbing mountains in the same light.

Tenzing Norgay, the famous Indian Sherpa, who was one of the two men who climbed to the top

of the world's highest mountain, wrote of the relation of leaders and subordinates in his autobiography, *Tiger of the Snows*: "Here again I must be honest and say that I do not feel his (Hillary's) account, as told in *The Conquest of Everest*, is wholly accurate. . . . In speaking of this I must make one thing very plain. Hillary is my friend. He is a fine climber and a fine man, and I am proud to have gone with him to the top of Everest. But I do feel that in his story of our final climb he is not quite fair to me; that all the way through he indicates that when things went well it was his doing and when things went badly it was mine. For this is simply not true. Nowhere do I make the suggestion that I could have climbed Everest by myself; and I do not think Hillary should suggest that he could have, or that I could not have done it without his help. All the way up and down we helped, and were helped by, each other—and that was the way it should be. *But we were not leader and led. We were partners.*" (*Italics mine.*)

The above retelling of the final assault to the top of Everest shows eloquently the changing leadership functions which were shared by many people in the attempt to solve the problem of climbing a mountain six miles high. Although Sir John Hunt was the principal leader, many others performed leadership functions on the expedition: Tenzing, as Sirdar (leader of the Sherpas), Hillary, Lowe, Evans, Bourdillon, and all the others who came to the fore as different problems arose on successive occasions during man's first successful climb of Mt. Everest.

Although the fruits of this new concept of leadership, of giving subordinates opportunities to display their wares in various pressure-type situations did not ripen until the latter days of World War II, the roots of this idea went back to pre-World War II days. In 1939, the great American soldier, General George Marshall, foresaw the need for testing subordinates and giving them leadership opportunities in peacetime situations, so that, if and when the "whistle blew" again, the United States would have a tested reserve corps

Northrop Scientists To Pit Man Against Electronic Robot

Scientists at Northrop Aircraft, Inc., are conducting studies to determine the limits of man's mental and physical abilities to command supersonic aircraft, Edgar Schmued, Northrop vice president in charge of engineering, disclosed.

Northrop has assigned Psychologist Gerald F. Rabideau and Physiologist J. Gordon Wells to conduct advanced studies in the field of human factors engineering in order to determine the practical points in terms of high speed flight at which man's mental and physical abilities must be subordinated to the robot "brains" of electronic computers and the "muscles" of servo-mechanical systems.

Findings of Dr. Rabideau and Dr. Wells will be used by Northrop designers assigned to high speed aircraft projects, including development of a new supersonic jet training airplane.

They will carry out their programs under the direction of Earl L. Eckerson, head of Northrop's Human Factors Engineering and Equipment Design Section.

of military leaders (who were predominantly subordinates at the time). In his own words General Marshall predicted at that time: "If we're drawn into this war, we must not be caught unprepared. The great thing is leadership—competent leadership at the very start, so that the lives of our young soldiers won't be thrown away while we sort out good generals from bad ones, as Lincoln had to do. . . . I've spent some sleepless nights thinking about what I'd say if the day comes when the President sends for me and says: 'Marshall, to whose charge shall we commit the lives of a couple of million American kids on the battlefield?' So I've made a little list. . . . The world has heard a good many of those names since. (Eisenhower, Bradley, Hodges, Patton, Clark, Devers, Patch, Collins, etc.)

"These are Colonels and Lt. Colonels whom I've picked out for special attention—what you might call a course for sprouts. I've picked them either on my own judgment of each individual or on the recom-

mendation of others in whose judgment I have confidence. I'm going to test these men. I'm going to give them the toughest jobs I can find, pile burdens on them until they sweat. Then I'm going to shift them suddenly to new positions of even greater responsibility. I'm going to allow them to think that I'm treating them arbitrarily, even harshly, asking more of them than should be asked of mortal men. In that way, with the maneuvers to help in forming an opinion, I'm going to find out as well as possible short of the test of actual war, whether these men are fit to command American soldiers in the field. Some will fall by the wayside. But those who come through will be army and corps and division commanders if we have to fight. . . . I want to know now who the good men are, so that the country won't have to pay in blood to find out later on."

The result: General Marshall did not have to relieve *one* general from 1942 to 1945 as Lincoln did with Burnside, Rosecrans and McDowell. There were no Bull Runs and Chicamaugas.

In any future conflict, subordinates will have many opportunities to exert leadership and command on an individual and a shared basis. From the young Lieutenant alone and unsupervised flying a supersonic jet carrying an atomic bang, to the officer who has the responsibility for stopping an enemy aircraft which is capable of wrecking one of our cities or to the airman radarscope scanner in an air defense filter center, all are in a position to exert leadership—at the TIME when it becomes necessary for them to do so. From the second when an unidentified blip on the radarscope is labelled "ENEMY" till the time when he is intercepted and shot down short of his target, many people have made split second leadership decisions. Many of these decisions were made by subordinates, who are leaders because of their know-how and the situation in which they find themselves.

Yes, subordinates can be leaders too. Let's cultivate their leadership capabilities at every opportunity where we can set up situations to encourage and observe them in action. In this way, America should

have no fear of the quality of her future military leadership in recurrent times of crises.

Hercules Sets Parachute Drop Record

The U.S. Air Force's new medium troop and cargo carrier, the prop-jet C-130 Hercules, has successfully dropped the heaviest single load ever extracted by parachute from an airplane for aerial delivery.

A 27,000 pound load was extracted from the prop-jet transport during a series of aerial delivery tests at El Centro (Calif.) Naval Auxiliary Air Base, the Air Force and Lockheed Aircraft Corporation, builder of the plane, announced.

At least two—and probably four—new world records were established during these tests.

The air freighter, soon to enter active service with the Air Force's Tactical Air Command, made aviation history in multiple deliveries as well as in the single load drops.

During the flights, a huge road grading machine—such as commonly seen working the highways of the nation—floated through the air over California.

However, this was not the heaviest single item to be yanked by parachute from the C-130. A 27,000-pound dummy load of iron was the record-breaker. This weight included the iron, the platform carrying the load, and the six 100-foot cargo parachutes necessary to float it easily to the ground.

The aircraft was flying at an altitude of 2,000 feet, when an extraction parachute pulled the loaded platform out into space, and six cargo chutes lowered it to the earth. The delivery was considered successful.

Sixth Vickers Aircraft Conference To Be in Detroit November 13 and 14

The Sixth Transport Aircraft Hydraulic Conference has been scheduled for November 13 and 14 at the Park Shelton Hotel, Detroit, Michigan, under the sponsorship of Vickers, Incorporated.

Attendance will once again be by invitation only. The 1956 program will follow topic suggestions from conference participants and is to include for the first time a

strong emphasis on original equipment, hydraulic system design for the airframe manufacturer. Open forum sessions will also include discussions of maintenance and service—ideas, problems and solutions.

Illustrated technical papers covering recent developments in transport aircraft hydraulics will be presented during each forum session.

Navajo Freight Building Unique Terminal

A unique feature of the new \$1 million terminal being constructed in Denver by Navajo Freight Lines, Inc., will be facilities providing for the loading and unloading of pickup trucks under cover, as a protection against the weather.

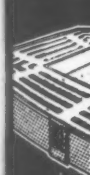
Work is almost half completed on the building which will serve as a concentration point for the present Denver terminal, general offices and shops, currently occupying three separate locations in the Colorado capital.

Navajo president Laurence Cohen said offices in the new building will consist of two floors and a semi-basement, embracing 24,000 square feet. The dock is being built to accommodate 46 trucks and trailers and will cover a 16,000 square foot area, while an additional 35,000 square feet will be allocated to the maintenance department for tractor-trailer maintenance facilities, rebuild shop, wash rack, grease pit, tire shop and parts room.

General Tire Orders First Executive Version Of Fairchild F-27 Twin-Propjet

General Tire & Rubber Company, a pioneer in the use of aircraft for company transportation, recently became the first corporation in the nation to place an order for the executive version of the Fairchild F-27, a twin-propjet, pressurized transport with a cruising speed in excess of 280 miles an hour.

Richard S. Boutelle, president of Fairchild Engine & Airplane Corporation, and William O'Neil, president of General Tire & Rubber Company, announced the signing of a contract for the F-27, which is scheduled to be delivered early in 1958.



Lockheed Broadens Top Management Structure

Creation of a new position, Chief Executive Officer, and promotions in several branches of the company to give greater depth to top management, were announced by the Lockheed Aircraft Corporation.

Robert E. Gross, who up to the present time has occupied both the positions of Chairman and President, will continue to be, as in the past, Chairman and the chief executive of the company.

Courtlandt S. Gross, who has been Executive Vice President of Lockheed, will become president of the corporation under the action of the Board of Directors who today elected to promote its younger executives effective October 1 in a general move to strengthen the company for the future.

The Gross brothers have been closely associated in the manufacture and marketing of aircraft since 1928, and have been together in the management of the present company since 1932. Courtlandt Gross was president of the Vega Airplane Company, a subsidiary of Lockheed prior to its merger with the parent company.

The broadened management structure, an outgrowth of the long-range planning program instituted by Lockheed three years ago, also calls for a Corporate Policy Com-

mittee which was established today when the Board ratified the management moves.

Pilot 'Can't See,' Yet 'Sees' Coastal Point from 220 Miles

Speaking of improving aerial navigation . . .

The air crew of an Air Force C-97 transport plane, returning recently from Europe in bad weather, achieved a landfall at Cape May, N. J., from a point 220 miles out over the Atlantic.

This long distance "pickup" was accomplished—despite the flat terrain of Cape May—by using a Sperry APN-59 airborne radar system, the Sperry Gyroscope Company said.

Believed to be the smallest and lightest for its size and range, the new Sperry equipment performs precise, varied functions of search and surveillance, storm detection and other all-weather navigation procedures.

It has been ordered in great numbers for use in the Air Force's troop and cargo-carrying transports.

The lightweight radar can be adjusted for pinpoint, distortion-free viewing of both ground and air objects at distances from three to 240 miles, Sperry said. It has enabled aircraft to avoid severe thunderstorms and maintain "hair-line" ground courses in extremely bad weather.



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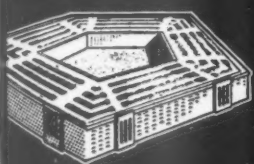
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tracked vehicle detects the current in the wires, and indicators in the cab give the driver his position and warns him when the vehicle gets out of bounds or crosses a trail wire.

Department of the Air Force.
The General Electric Corporation is producing a "Data Link" radio unit for the Air Force that will receive ground-control instructions from an electronic computer to speed up and simplify enemy aircraft interception. The new system enables several hundred fighter aircraft to receive coded digital information simultaneously on one radio channel from a single ground control station. The information which includes heading, altitude, and speed to make contact, can be fed aloft to the interceptor's automatic pilot or transmitted to guided missiles.

Department of the Navy (AFPS).
"Operation Deepfreeze II," the 1956 expedition supporting American scientific study in the Antarctic, got underway last month. The second venture to the South



*Washington
Management*

Department of Defense (AFPS).

A full meeting of the Cordiner Committee was held on September 28th in the Pentagon where recommendations were finalized for keeping skilled men and women in the services. Ralph J. Cordiner, chairman of the committee made up of military, civilian and Defense officials, has traveled many miles gathering first-hand information from commanders, servicemen and technicians.

Department of the Army. Trails in the arctic regions are being made safer by the Army through the use of electronic marking techniques. The system, tested successfully on the Greenland Ice Cap, consists of two parallel wires and a vehicular mounted radio-type receiver. An alternating current is fed into the wires, which are buried beneath the snow on either side of the trail, marking the route electrically. The receiver on a

Pole, directed by Rear Admiral Richard E. Byrd (ret.) is part of a four-year program of earth-science studies for the International Geophysical Year, 1957-58. Men left at the bases last year will accomplish as much as possible between the time daylight began in September and when the ships carrying supplies can first break through the ice pack in December.

Department of the Army. Major General Emerson C. Itschner, became Army Chief of Engineers on the first day of this month. The General has been acting deputy Chief of Engineers for construction, and has just returned from a tour of Corps of Engineer activities in Hawaii, the Far East, the Middle East and North Africa.

Department of Defense. Secretary of Defense Wilson has appointed a committee to study existing Department of Defense directives, regulations, practices and procedures relating to the safeguarding of official classified military information in the interest of the security of the United States. The committee will be headed by the Honorable Charles A. Coolidge of Boston, formerly an Assistant Secretary of the Department of Defense. Mr. Wilson has asked the committee to submit a report to him and to make any recommendations it determines necessary to assure greater protection of classified material.

Department of the Army. Secretary of the Army Wilber M. Brucker recently announced the appointment of Major General Robert A. Schow as Assistant Chief of Staff for Intelligence. General Schow, who has been Deputy Chief of Staff for Intelligence since June, 1954, succeeds Lieutenant General Ridgely Gaither, whose assignment as Deputy Commanding General for Reserve Forces, Continental Army Command, Fort Monroe, Virginia, was announced last month.

Department of the Air Force. The Air Research and Development Command will start construction early next year of a special multi-million dollar facility for the testing of components which will make up the super high-power radar

systems of the future. It will be located at ARDC's Rome Air Development Center in New York.

Department of the Army. More than 200 representatives of various industries will attend an industrial procurement conference at the Pentagon on Friday, November 18th to discuss with Frank H. Higgins, Assistant Secretary of the Army (Logistics) and a selected panel, the subject of Army procurement. Objective of the meeting is to maintain the contractual relationships between government and industry through an informal discussion of problems in the procurement field.

Department of the Navy. More detailed information about the PETREL, an air-to-surface missile being produced by the Guided Missiles Division of the Fairchild Engine & Airplane Corporation, have recently been released. In the best interests of National Defense, the missile was not displayed at the National Air Show at Oklahoma City last month. It has been disclosed that the PETREL consists essentially of an airframe with guidance, stabilization and propulsion units, and a torpedo-type payload. Approximately 24 feet long, it has a wing-span of thirteen feet and weighs (gross) 3800 pounds. The missile is launched from U.S. Navy P2V-6B aircraft, a number of which are already equipped with the PETREL, designed primarily for use against enemy ships at sea.

Department of the Air Force. Production of Air Force jet tankers has been increased to a rate of 20 tankers a month substantially earlier than previously planned. Peak production of the Boeing KC-135's costing approximately \$4 million each, is expected by mid-1959. Air Force Secretary Donald A. Quarles announced the new production rate has been approved by the Secretary of Defense. Funds will come out of \$900 million which was added to the Defense budget by the Congress.

Department of Defense. The Defense services will use a new version of the Armed Forces Qualification Test within the near future on enlistees. Revised after two years of research and study, several cate-

gories will be retitled, and scoring will be on the percentile basis.

Department of the Army. Army Signal Corps scientists recently captured six bottles of air from the borderlines of outer space. These only existing samples of pure air from very high altitudes of the upper atmosphere are expected to help scientists unravel basic mysteries in rocketry and geophysics. New tests on the gasses could pave the way for flights of future missiles, man-made moons and even space ships, all of which must pass at high speed through such high altitude air. The precious samples were collected 75 miles up by steel bottles inside the nose cones of two rockets.

Department of the Navy. The fleet's fifth Forrestal class carrier has been officially named the USS KITTY HAWK. Construction of the huge flattop began last month at the New York Shipbuilding Corporation. The second Navy vessel to bear that name, it was selected by the first session of the 84th Congress when it passed the fiscal 1956 shipbuilding appropriation.

Department of Defense. Secretary Wilson recently turned back the fiscal 1958 \$48.5 billion defense budget for further study and reworking by the three major services.

Department of the Air Force. The Strategic Air Command's 27th Strategic Fighter Wing at Bergstrom Air Force Base, Texas, will begin conversion this month from the Republic F-84 to the F-101 Voodoo fighter planes. The F-101, produced for the Air Force by McDonnell Aircraft Corporation, is the first supersonic fighter on the inventory of the Strategic Air Command.

Department of the Navy. A new American speed record of 1,015.428 miles an hour was announced at the national aircraft show last month. Commander Robert W. Windsor, USN, flashed to the new record in a Chance Vought F8U Crusader. The actual run was made at Inyokern, California, where facilities permitted precision timing of the event. The existing world speed record of 1,132 miles an hour is held by a British Fairey Delta.

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8. **Outline of History** — H. G. Wells — New 2-volume story of mankind. 1,312 pages. Orig. \$5.00
9. **Nature's Wonders in Full Color** — Nature's strangest sights. 462 photos. Orig. \$7.50
10. **Astounding Science Fiction Anthology** — Best stories from famous s-f magazine.
11. **Thorndike-Barnhart Concise Dictionary** — 1956 edition, 70,000 entries, 544 pages. Orig. \$2.00
12. **Greatest Story Ever Told** — A reverent retelling of the story of Jesus. Orig. \$2.95

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How to Use Armed Forces Management's Library—

Inserted in this issue, a postage free card is provided for your convenience in requesting descriptive and informative literature. This will be forwarded to you, without obligation. Many cost saving ideas are generated by Operating Departments that have referenced information on products available. Purchasing Officials will find this type of information invaluable. All that need be done is: fill in name and address, circle that which will assist you, and drop in the mail.

SUB-MINIATURE PILOT LIGHTS

Dialight Corporation. Dialco has announced a new sub-miniature pilot light with rotatable lenses that is spring mounted to facilitate positioning after installation of any unit. These compact lights (approximately 1 1/4 x 9/16" overall) are ideally suited for many military applications where lighted "messages" are required. Complete with a wide assortment of lens colors, this series of Dialco lights is a figure, letter, or word hot-stamped into the flat face of the translucent plastic lens filled in for sharp contrast.

For more facts request No. 1 on reply card

HI-SPEED CONVEYOR FLEX-A-SWITCH

Metzar Conveyor Company (See Cut) New Automatic Guard Rail



makes Flex-A-Switch suitable for high speed travel and is recommended where cartons, cans or boxes are traveling at 100 feet per minute or faster. It can be furnished where shifting of the switch is electric (illustrated), pneumatic or manual, and controls can be remotely installed. Equipped with automatic Guard Rails and used in series, makes possible an infinite number of patterns of travel in either direction. Prices and complete information are available without obligation.

For more facts request No. 2 on reply card

TERRATRAC HYDRAULIC BACKHOE

American Tractor Corporation. A new 6-page, three-color bulletin, TTS-121, is available illustrating the special features of a new TerraTrac hydraulic backhoe, with detailed operational drawings, and complete specifications for both backhoe and TerraTrac crawler tractors on which it can be mounted. First of its kind to be designed, built and fully warranted by a crawler tractor manufacturer, for heavy-duty crawler use, it is said to offer 12 exclusive features. May we send you a copy for your use?

For more facts request No. 3 on reply card

ARMED FORCES MANAGEMENT advertisers support and are familiar with the needs of the Armed Forces.

BENDIX-DECCA NAVIGATOR SYSTEM

Pacific Division, Bendix Aviation. A new 20-page 4-color brochure detailing the Bendix-Decca Navigator System which describes how the system works, component units, technical data and the many advantages, is obtainable from Armed Forces Management Library. A copy is available to you personally without obligation by this time-honored organization.

For more facts request No. 4 on reply card

TACHOMETER TAKEOFF HEAD

Metron Instrument Company (See Cut). The new Series 34 used with Metron Indicators, measure speeds between 100 and 5000 RPM. They are available now with A.N. screw mounts for aircraft tachometer takeoffs, and also with S.A.E. screw mounts for gasoline,



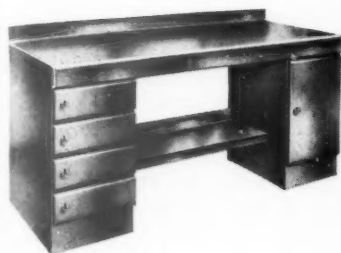
diesel, marine, railway or stationary engines and compressors. Rugged construction without brushes, slip rings or other parts requiring maintenance or replacement, are used. A double pole, double throw switch with a capacitor senses speed when the takeoff shaft rotates either direction. A current (exactly linear with respect to speed) is transmitted to a centrally located Metron Indicator up to 1000 feet away. Either one of two stainless steel keyed shafts are standard. Also available are two alternate shafts: 5/16" round and 1/2" square. Heavy duty ball bearings are 5/8" O.D. We shall be pleased to send you additional technical data without obligation.

For more facts request No. 5 on reply card

STEEL WORK BENCHES

Equipto Corporation (See Cut). Many newly designed steel work benches featuring double drawer

ARMED FORCES MANAGEMENT



sections, drawers and cabinet, double cabinets, and sliding-door enclosed storage beneath work surfaces have been added to the already extensive line of Equipto MODERN-FLOW Steel Work Benches. This huge selection, now numbering 161, is made to the highest specification. A complete 16-page catalog No. 200, is available, and will show you how your organization can have new modern equipment at extremely low cost.

For more facts request No. 6 on reply card

MARVELCO TEST SET

Marvelco Electronics Division of National Aircraft Corporation. Now available to electronic laboratories is a new test set for the minority charge carrier lifetime of a semiconductor material. The system is made up of three units: a test cabinet, a 535 Tektronix Oscilloscope with a 53/54C dual beam plug-in unit, and a Tektronix 121 Preamplifier. More technical information is available upon request.

For more facts request No. 7 on reply card

DUST CONTROL

Golden Bear Oil Company. A new product to combat dust, long considered one of the nation's major enemies, known as GOLDEN BEAR DUST-BINDER has recently gone into production. One of the most outstanding uses is in Air Force installations. (The dust-binder mentioned in the article on Edwards Air Force Base, published in the June 18 issue of Life Magazine, is Golden Bear Dust Binder.) Further information is available from Armed Forces Management Library.

For more facts request No. 8 on reply card

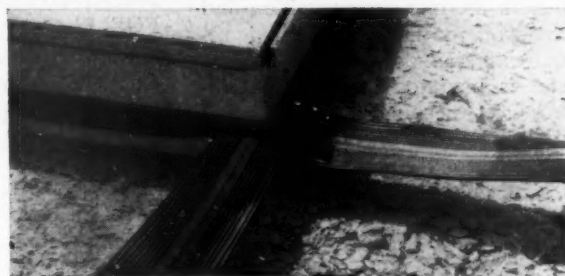
SOLVENT VAPOR DEGREASER

Tect, Incorporated. A new, safety-engineered Solvent Vapor Degreaser, designated Model 22 and priced at only \$259.00, has been announced by this organization. This versatile unit can be operated

SPECIFY the most efficient waterstop on the market



SEALTIGHT



DURAJOINT

Polyvinylchloride=PVC

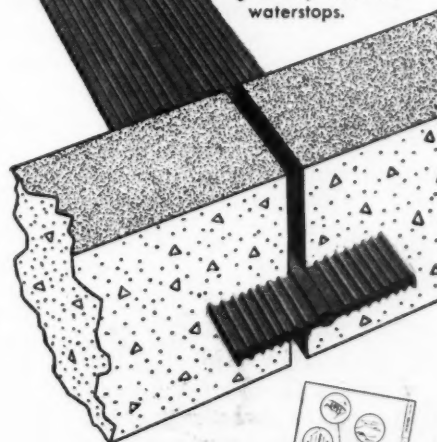
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"DuraJoint", extruded from Polyvinylchloride=PVC, was specifically compounded and designed for use between adjacent sections of concrete structures.

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- ✓ Quickly—easily spliced "on the job" by merely applying heat and holding the ends together until bonded . . . requires no welding or vulcanizing equipment.
- ✓ Available in lightweight, easy to handle 50 ft. coils . . . withstands abuse without damage



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with either Vythene, Trichlorethylene, or Perchlorethylene. The lower thermostat prevents breakdown of the chlorinated solvent due to thermal decomposition and shuts off the machine when it requires draining. The upper thermostat is mounted above the stainless steel condensing coil as a safety device to prevent the solvent vapors from going out into the room in the event the water supply fails. We shall be glad to send you more detailed information.

For more facts request No. 9 on reply card

POWER VOICE MOBILE SPEAKER

Motorola Incorporated. The first mobile communications type speaker with a built-in transistor amplifier has been announced by Motorola. The "Power Voice" speaker provides up to ten times the audio output of standard passive speakers in mobile two-way installations. The speaker element has a band-pass frequency response tailored specifically for mobile service. It accents voice frequencies but suppresses ignition noise and other interference above and below the basic voice frequency range. More technical information is available upon request.

For more facts request No. 10 on reply card

PACKAGING BOOKLET

The Kord-Mar Company. Publication of a new booklet developed from reports received from industrial leaders, describes and illustrates the Kord-Mar Packaging Program which is developing supply material economies and wrapping and packaging efficiencies. A free copy has been reserved for you.

For more facts request No. 11 on reply card

IDENTIFICATION NAMEPLATE PRESS

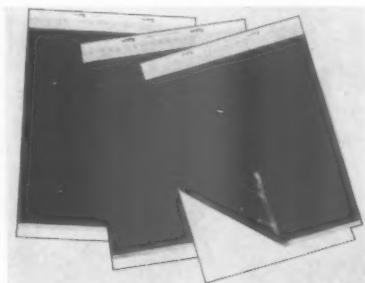
Clearview Company. A new compact machine for stamping individual letters and numbers on all types of identification plates and tags has recently been announced by the Clearview Company. Truly a multi-purpose piece of equipment, it simplifies property control systems and is extremely low in cost. A complete catalog explaining this equipment is available together with a list of hundreds of suggested

uses to interested organizations and individuals.

For more facts request No. 12 on reply card

DUPLISETTE-CARBON-SET FORMS

Carteret Printing Company (See Cut). This well-known manufacturer and designer of "Blue Chip" business forms has just introduced its new carbon-set form, known as "DupliSette". Designed to eliminate waste time and motion in typing carbon copies, DupliSettes



are ready-made second-sheet-and-carbon set units to be inserted in the typewriter simultaneously with letterhead or other form for making as many carbon copies as desired. Office management time-and-motion studies have demonstrated the vast savings in operating costs possible with the use of DupliSette. Samples and descriptive literature are available without obligation.

For more facts request No. 13 on reply card

UNIVERSAL TRENCHER

The Challenge Manufacturing Company. Capable of trenching up to 4 feet in depth and 14", 16" and 18" widths, the new Challenge Universal Trencher is equipped with the latest controls and safety devices. The new trencher will switch dirt from side to side without stopping and will dig square corner trenches. Complete information on this and other models is available to your organization.

For more facts request No. 14 on reply card

PRINTING ADDING MACHINE

Fremaco International, Incorporated. A new SUMMIRA Printing Adding Machine has recently been added to the Fremco line. The Summira, according to the company, is the lowest priced print adding machine with direct subtraction on the market, costing ap-

proximately half as much as the next highest competitive model. Designed with nylon gears requiring no lubrication, this well-constructed machine has visible total and individual entry dials so each figure may be checked by the operator as it is put into the machine.

For more facts request No. 15 on reply card

BELCO REPLACEMENT FAUCET STEMS

Miller Manufacturing Company. Leaking compression type faucets, lost water and excessive maintenance costs are gone forever with the installation of Belco ball bearing replacement stems, complete with bibb washers. The bibb washer is only under compression and is not subject to cutting or grinding action.

For more facts request No. 16 on reply card

MUTUAL INVESTMENT FUND FACTS

Brown, Madeira, and Company. This company, specializing in mutual investment funds, will send, without obligation, facts about conservative, middle-of-the-road, and aggressive types of investments and mutual funds.

For more facts request No. 17 on reply card

VISUAL CONTROL BOARD

Wassell Organization, Inc. Product not only schedules but automatically checks with time, line, and color control, has low original and upkeep cost.

For more facts request No. 18 on reply card

COMMON STOCK INVESTMENT

Hamilton Management Corp. Through Hamilton Funds, Inc., a managed common stock investment fund, this firm offers lump sum or monthly investment plans to fit any budget. Interested persons can inquire without obligation. Firm recently declared another quarterly dividend.

For more facts request No. 19 on reply card

VISUAL MANAGEMENT CONTROL

Graphic Systems. This New York firm invites men interested in efficient management to get things done with Boardmaster Visual control which gives a graphic picture of operations, spotlighted in color, saves time, money, and stops errors.

For more facts request No. 20 on reply card

Maintenance Management

(Continued from page 17)

itself to the performance of maintenance by the application of modern concepts. An examination of the functions of the Installations Engineer and his relation to supporting staffs produces a requirement for an organization outline representing six predominant activities:

1. Management
2. Engineering
3. Maintenance and Repair
4. Preventive Maintenance
5. Utilities Services
6. Fire and Aircraft Rescue

Such an organization was set up to work. A most important feature is that adequate capability for work control and analysis is incorporated.

In a productive type of activity, the processes of work control, the use of standards, and performance analysis are relatively familiar. However, maintenance work, with almost no two jobs being similar, requires a somewhat different approach. There were found to be six basic steps that now may be considered the principles of maintenance work control:

1. Get workmen out of supply, administrative, estimating and transportation business. This leaves the workman available for the work for which he was employed originally.
2. Determine manhour potential for work forces. No real work planning is possible without exactly knowing this capability. Nor would step 5 be possible.
3. Completely plan and set a standard for each job in terms of man-hours. Since the work is not repetitive, the standards are largely set by estimates. The organization chart shows the Management Branch Work Control Section where standards setting is accomplished.
4. Measure and schedule material, transportation, and equipment required for each job. This is accomplished by the Work Control Section of the Management Branch. Here, relatively few specialists accomplish the work instead of many journeymen. The shop forces have no real understanding of work scheduling, nor are they in a position to see the

effects of their efforts on the total operation.

5. Schedule the job to the appropriate work force only when the required labor, materials, transportation and equipment are available. This is nothing more than a true application of one of the most basic principles of management—giving the man the job, the authority and the necessary tools to do the job.

6. Measure the performance by evaluating the results and adjusting standards continuously. This is accomplished by the Analytical Unit, Management Branch. (In the routine conduct of commercial enterprise this evaluation may be shown automatically in the profit and loss columns of the ledger).

Some indisputable facts, which show the effectiveness of the work control system, follow. In July, 1954, workmen put in about 1,500 hours a month chasing supplies. With proper scheduling and control the loss of time dropped to nearly zero not quite a year later. This means 1,500 added manhours per month for maintenance—equivalent to approximately nine people.

In July, 1954, the time consumed from receipt of a complaint call to completed work averaged twelve days. Since complaint calls require almost immediate action (lights out in a building, break in plumbing, no heat in building, etc.), this was not a particularly satisfactory showing. Proper work control, together with the advent of systems for adequate supply and transportation support (discussed later), had reduced this period to one day by December 1955. The use of radio equipped "trouble shooting" vehicles, in conjunction with work scheduling, is reducing this to a matter of hours. The results are much improved customer service and a 91% reduction in the backlog of complaint work orders. Most important, the entire work load requires no more than sixteen man-hours per day on the average, whereas previously thirty were required.

Work control did not create an "empire-building" spree. Only 12 people are required to perform the entire function, of which all but four of these were already employed elsewhere within the organ-

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You can save \$1.00 per year or more per faucet by equipping leaky faucets with inexpensive Belco ball bearing washers. No more leaks. No more maintenance costs. No more rusted lavatories and sinks. No more wasted water. Figure it out.



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Belco Division

Miller Manufacturing Co.

5919 Tireman, Detroit 4, Mich.

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ization. Work control does not require a large space either.

To schedule and plan work, materials must be available. For years this has been a major obstacle to any scheduling or measurement. For instance, the initial survey revealed that out of every 100 items requested, 10 were immediately available. To say the least, when this happens planning is discarded and improvisation takes over. This may get the job done, but it is extremely costly in terms of man-hours. From these facts it was determined that a system of timely "close support" was needed. A must were these seven factors:

1. There should be an exclusive source close to the user. Exclusiveness is necessary so that other agencies do not draw items that may be planned for use on a maintenance job ten days hence.
2. There should be an adequate service stock. Sixty days supply has been determined as adequate and reasonable by both the Installations Engineer and Supply Officer.
3. Access should be limited. In other words, keep the workmen

out. A material control unit has been created to provide all necessary liaison with the supply source.

4. There should be a "Holding Area" where materials are earmarked for work orders and accumulated until the work is scheduled. This keeps materials from being "borrowed" or diverted to unauthorized work and serves as the one place from which all materials are drawn.

5. There should be a 15 day bench stock for each shop and Preventive Maintenance trailer. These stocks are maintained at that level by the Material Control Unit and provide a ready source for minor emergency work, preventive maintenance, and complaint-type jobs.

6. There should be simplified paper work and a streamlined flow of paper to speed up supply action. Having one form serve as a bill of materials, requisition, and stock record for bench stock reduces the paper work considerably.

7. There should be simplified and more direct local procurement action. When an item is needed that is not available in supply and substitutions are not possible, then local procurement must be fast and direct.

Another factor necessary for adequate work scheduling is to have the ability to get supplies to the job and *on time*. The Air Force has found that it is generally most economical to centralize motor vehicles in a base motor pool. This is not too suitable for maintenance, because for maintenance purposes a vehicle is an essential working tool, sometimes even a mobile shop. It was clear that transportation for the Installations function must be more responsive to maintenance needs than seemed to be the case. In support of this conviction a survey was made of nearly a hundred Air Force stations for six months to bring out

facts as to how transportation support was affecting installations work. A summary of the survey showed:

In a year, shortage or lack of timely transportation resulted in a loss of man-hours valued at \$2,000,000. Incidentally, this amount, if spent for $\frac{1}{2}$ ton pickups, would buy 1,600 or more. Not included in this loss of \$2 million, was the revelation that over 1,000 Installations personnel would drive their own cars more than 10,000 miles a day to perform their work on the base. Reimbursement for this is authorized at the rate of 7 cents per mile. At over 2½ million miles a year, such reimbursement, if claimed, would amount to \$175,000.

By no means can this be considered the entire problem nor can delays be attributed entirely to shortages of transportation. It was found that there was considerable and justifiable criticism of the poor management of vehicle utilization after they were dispatched to the Installations Engineer. Once he had it, the Installations Engineer employee frequently used a vehicle in any manner he thought best which not always resulted in the most productivity possible. Experiments indicated that a most satisfactory arrangement was to establish a sub-motor-pool for the Installations Engineer to which would be allocated, on a permanent basis, a predetermined number of vehicles. The responsibility for furnishing and maintaining this quota was

given to the Transportation Officer. The responsibility for the daily dispatch of these vehicles was placed with the Installations Engineer and integrated with work control. Actually, no additional vehicles were involved and the main benefits were derived from the fact that transportation could be scheduled well in advance and made to meet exactly, and on time, the specific needs to move material and personnel. Efficiency of vehicle utilization was further increased by the modification of some vehicles to utility trucks or actually small mobile shops. (See cuts).

The results are quite impressive as illustrated in figure 9. The decrease of lost time produced a gain in man-hours equal to 7 men in a 150 man force. Such a gain projected to a work force of 50,000 would equal 2,000 men.

A complete measure of the total increase in effectiveness brought about by work control coupled with a clear cut organizational structure and adequate supply and transportation support can be readily visualized by examining Fig 10. It reflects the fact that in July 1954 only 40% of the efforts of the work force went into the primary job—maintenance. The non-productive time, therefore, was 60%, which was attributable to the work force chasing supplies, waiting for transportation, doing clerical work, filling-in requisitions and time cards and even estimating their own work. A year later, a 78% productive factor was produced. (80% is generally the accepted optimum). It is interesting to note that in October it can be seen how newly assigned personnel, not completely familiar with the features of work control, by-passed some of the developed procedures. The trend is quickly apparent. The productive curves went down 8%. This was an effective way of convincing the newcomers. To gain full under-



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standing of the importance of the increase in productivity represented by the 38% (from a low of 40% to a high of 78%), consider that in a working force of 150 this equals 57 man-years. If this factor were applied Air Force-wide to only one-half of the 110,000 installations personnel doing the type of work that can be termed recurrent maintenance, the equivalent of 20,000 more men would be provided for maintenance.

While the foregoing was impressive to the Board, they were faced with the realization that the success of such a program Air Force-wide would depend a great deal on the impetus that could be provided and maintained by the major air commands and Headquarters USAF. Obviously, the staff of a headquarters cannot check physically all phases of maintenance at over 300 large bases and nearly 3,000 odd-sized installations all over the globe. What was needed were realistic "yard-sticks" to use as indicators. Coincidentally, the Air Force Budget and Manpower people wanted a yardstick for their business. There was in being a cost accounting system intended presumably to give cost data that might serve this purpose. For many reasons, however, the existing system was not adequate. What was needed was a cost system that would be simple, accurate, and realistic; that would generate cost data appropriate for management, technical analysis and control; a system that upon proper evaluation and application would produce standards, indicate "trouble" or progress, and be usable as a valid basis for many staff actions. It was determined that such a system must incorporate these features:

(1) Facilities grouped in similar classes; that is, by construction and predominant use: i.e., permanent, temporary, administration buildings, shops, quarters, medical, etc. It has long been recognized that the use and type of construction largely governs the extent of maintenance necessary. Unless facilities are classified, maintenance costs of barracks versus administrative space is like comparing oranges and apples.

(2) Segregated operating and maintenance costs. Usually the

operation of plants and systems is an area in which much improvement as to manpower efficiency can be made. Unless the indices for operation and maintenance are separated, no meaningful yardsticks result.

(3) Take into account sufficient cost elements to ensure comprehensive costs. In addition to labor and material, such elements are, for example: overhead, cost of fuel, equipment, rental, maintenance and repair of mobile equipment, spare parts, and such.

It was found that one other requirement existed before these indicators and yardsticks could really be useful; that is, valid data as to our plant must also exist: i.e., how many square yards, cubic feet, acres, etc. A Public Law requires the Services to keep Real Property accountable records. The system that was in being generally meets the requirements of the law; however, it was so antiquated and cumbersome that it did not fill the need for an internal management tool. In deciding what to do here the group determined that a modern, simplified, useful and accurate real property account system must be:

(1) Simple — easily maintained, with a minimum of forms.

(2) Accurate—reflecting all pertinent data.

(3) Timely—incorporating the data quickly.

(4) Auditable—constitute Air Force accountable records.

(5) Usable—provide timely data for the day-to-day needs of the Installations Engineer or other staff offices as well as report requirements.

A system, such as this, has been developed and integrated with work control resulting in a most effective management tool.

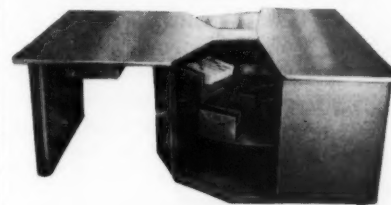
A number of other advantageous by-products have resulted from the developments. It might be of interest to merely list three most significant ones:

(1) Using the real property data with the cost system should give the Installations Engineer a handy yardstick for predicting his funds requirement, and give other staff agencies at proper levels a tool with which to evaluate base and overall budgeting requirements.

(2) A series of new and simplified



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reports that really serve as a management tool have emerged. They are susceptible to ready interpretation, contain pertinent information and quickly apprise a Commander or Installations Engineer of management trends.

(3) Last but not least, paper work has been streamlined. On the average the number of forms required to conduct the Installations Engineer business has been reduced about 40%.

This is, in essence, the story of the development of a really modern and completely integrated system of management controls for a function that plays a vital part in bringing and keeping the Air Force at maximum readiness with a minimum cost to the taxpayer.

Anniversary Dates

United States Naval Academy	October 1845
Air Proving Ground Command	October 1942
Military Sea Transport Service	October 1949

Radar Control Devices Rate SAC's Top Bombardiers

New mobile radar control systems (MSQ's), tracking the flight of huge Strategic Air Command Bombers over the United States and Canada, were used to rate the nation's top bombardiers in the SAC's eighth annual bombing and navigation competition, which wound up recently, it was disclosed by the Strategic Air Command and Dynamics Corporation of America, makers of the MSQ's.

Developed for the Air Force by Reeves Instrument Corporation, a Dynamics Corporation of America subsidiary, the MSQ close support radar and computing equipment is enabling the SAC's Bomb Scoring group to determine the award winners in the "1956 battle of the air giants," without a single bomb being dropped.

Engines roared and pilots sang out "bombs away" in each of the 88 participating planes but there were no devastating blasts of an atom bomb or any other death-dealing missile during the six-day contests. The only visible evidence of the competing crew's ability to pene-

trate and destroy the target was inside the MSQ vans in the ghostly movement of tiny blips across a radarscope and in the silent tracing of a thin red line by an electronic pen on a blank paper. The blips represented the course of the planes coming in towards the target which had been picked up by the radar van's antenna and the electronic pen recorded the lightning computations of the computers on the plotting board.

Allowing for the type of simulated bomb, air speed, wind drift, etc., the scoring group knew exactly where the bomb should have hit and how the crew and plane's performance should be rated. The computations completed for this mission by the MSQ's "electronic brain," the scoring group got set for the next contestant.

If the "bomb drop" was exactly on target, the MSQ credited the crew with a "shack" or hit. If the bombs fell within a city block of the Radar Bomb Scoring site, the contestant got into the scoring column, but if his "drop" missed by a wider margin his run was "boondocked" and was ineligible for credit.

many global views, dominant regional language, Time Zone Chart, air pressure and winds, climatic regions, surface transportation facilities, air routes and terminals.

Section II is composed of the Political-Physical maps by regions and by political units. Each land mass is first shown in its entirety and then is divided into regions. The United States is shown in one large map, and is then followed by individual maps of each state. The same is done of Eurasia, Africa, Australia, and South and North America.

The Geographical Summaries accomplishes the purpose of adding to the understanding of life in all parts of the world. World tables cover broad topics, then sections are devoted to regions. The topics deal with political, economic and social conditions. Geographical Comparisons will answer many questions of specific nature, and tells of the largest islands, lakes, rivers, etc. of the world. Both natural and man-made wonders are covered.

Along with the numerous maps, charts, and tables, there is an explanatory text to provide the reader with clear facts and is of great value in defining the maps and in interpreting the meaning of tables.

This colorful World Atlas is unique in the publishing world and the outstanding features are made interesting and understandable. Encyclopaedia Britannica World Atlas does put the world, in many views, in the hands of the reader.

The Problem Approach

"PROBLEMS IN INTERNATIONAL RELATIONS," edited by Andrew Gyorgy and Hubert S. Gibbs. (Prentice-Hall, 330 pages, \$3.75).

The editors have done a magnificent job of assembling material relating to information of contemporary problems in the field of international relations. Case studies are made of diplomatic developments. The problem approach has the stimulus of giving a framework for study, illustrating basic principles, definite information of developments, and presenting the essentials to a comprehensive study



Book Reviews

by D. D. Corrigan

The World in Your Hands

"ENCYCLOPAEDIA BRITANNICA WORLD ATLAS," Geographical Editor, G. Donald Hudson; General Editorial Direction, Walter Yust.

As the Greek Atlas was believed to support the world on his shoulders, so does the Britannica Atlas hold the world in the hands of the reader. World awareness, peaceful strivings for better understanding of neighboring countries and peoples, created the need for a new approach to a world atlas.

Britannica published the first edition in 1942, and this year marks the twelfth edition. The original in 1942 meant much preparation was necessary, and research and months of study led to many facts in the accumulation of information. Plans were laid for continuous revision

and ways of improvement, until today the combined skills and talents of cartographers and authorities utilized more than 1000 documents and made more than 500,000 computations in preparation of the current volume.

The owner of this world atlas will do well to read the Forward, Perspective, and Notes to the Reader, to gain an appreciation of the objectives and to increase his understanding so that the material contained in the atlas will be of the greatest benefit.

The Table of Contents presents the larger scope while the Index is so detailed that it alone comprises 115 pages. The section titled "The World Scene" shows world distribution and world political geography. Here are shown maps giving a multitude of items, including

The cases selected were all drawn from the post-war period, to show the changing pattern in the modern era. Each case is presented in four parts; a factual introduction, series of problems, the body of the case, and finally by a general bibliography.

The Communist challenge receives the largest share of attention, with one section devoted to the Western response to communism. The Truman Doctrine, Marshall Plan, Berlin Blockade, North Atlantic Treaty Organization, Schuman Plan are all discussed in their perspective turn. Lesser powers, ideology and world politics, the United Nations, and current problems are all analyzed in respect to international relations.

The editors have made a scholarly attempt at a wide subject, and the result is shown in the intelligent manner in which the text is written. Many of these problems have been tested at universities throughout the country.

The Latest Word

"DIESEL OPERATION & FAULT DIAGNOSIS," by Gerald B. Fox (The Macmillan Company, 191 pages, \$4.50).

Gerald Fox is well qualified to write a book on diesel engines. He has the practical experience of forty years in the field, plus many years in association with the Admiralty Engineering Laboratory, in Great Britain, where he was in charge of testing and developing diesel engines for naval use. Not only did he supervise activities, but his advice led to improvements and to sound constructive reports.

A short history of diesel engine development is followed by a description of the fuel injection system, pistons, bearings, and lubrication. Air compressors and supercharges lead to the practical application of starting devices and aids. The author concludes with well illustrated examples of current engines. For the latest word on diesel engines, Gerald Fox tells all, in, "Diesel Operation & Fault Diagnosis."

A Comprehensive Study

"GOVERNMENT BUDGETING," by Jesse Burkhead (John Wiley, 498 pages, \$7.50).

The author states in the preface, "The study of government budgeting is a study in applied economics—in the allocation of public resources. This study must look at operations and begin with organization and procedure, the routines which have been established for decision-making in government. It should extend to an examination of the influences, governmental and nongovernmental, that come to bear on the decision-making process."

"This volume is divided into four parts. The first is devoted to setting the stage, in historical, institutional and procedural terms. The last chapter in Part I is a brief description of the phases of the budget cycle, each of which is then examined in greater detail in Part III. Part II is concerned with the classification of budgetary data. This is given prominence here because of the author's conviction that the way in which revenue and expenditure are grouped for deci-

sion-making is the most important aspect of budgeting. The last part of the volume deals with specific budgeting problems, many of which cut across subjects examined elsewhere, but are nevertheless capable of isolation for more detailed examination. The bibliography at the end of each chapter suggests readings relevant to the subject at hand. The suggestions are not intended to be comprehensive of the whole literature of budgeting."

"There is considerable emphasis here, possibly an overemphasis, on budgeting in the national government of the United States. There is underemphasis on budgeting practices and procedures in state and local governments in this country. There is overemphasis on the work of the central budget office, and relative neglect of budgeting in departments and agencies. Some of these deficiencies are due to the limitations of the author's working experience and observation. Some are due to the inadequacy of avail-



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able information. Many of the significant aspects of the budgetary process in governments in the United States have not been analyzed in the literature."

"Every effort has been made to indicate the breadth of the subject. The frequent excursions into allied areas and allied disciplines indicate the scope of the problems here considered, even though not all of these ancillary areas are thoroughly explored."

Presently Jesse Burkhead is Professor of Economics at the Maxwell Graduate School of Citizenship and Public Affairs at Syracuse University. He was a staff member of the U.S. Bureau of the Budget, and a member of the faculty of LeHigh University. He has also been a consultant to the Pennsylvania Joint State Government Commission, and for three years was associated with the Department of Economic Affairs of the United Nations. His experience and knowledge of government budgeting has enabled him to write this penetrating comprehensive study.

Timely Questions Answered

"THE SOVIET IMPACT OF SOCIETY," by Dagobert D. Runes, (Philosophical Library, 202 pages, \$3.75).

Dagobert Runes, world recognized philosopher, studies many aspects of Soviet society, and answers many questions that are asked today. Some of the pertinent questions he is concerned with are:

How has the Soviet raised or lowered human standards?

Is Soviet society free, safe, happy?

How are activities, vocations, and avocations dictated by the rulers?

Is the member of Soviet society fearful of secret arrest, detention, and trial?

Where does religion fit into Soviet society?

This book was actually written fifteen years before the Soviet-Nazi amity treaty, but no publisher would consider printing it until recently, due to the accusations of Communist practices and criticism of Marxist doctrine.

Mr. Runes clearly states his opinion of the Soviet Society, "the new communist bourgeoisie—hard-boiled engineers and managers,

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prostitute artists and writers; murderous spies, stoolpigeons, secret police, executioners and crouching, slimy officials. For the benefit of this herd of grasping opportunists, the communist demagogues are ready to sacrifice a world of freedom and democracy."

Recommended Reading:

"FROGMAN," by Marshall Pugh (Charles Scribner, \$3.50).

Interesting episodes about the life of Commander Lionel Kenneth (Buster) Crabb, British frogman who mysteriously disappeared near Portsmouth Harbor while a Soviet cruiser was at anchor.

"JOHN D. ROCKEFELLER, JR., A PORTRAIT," by Raymond B. Fosdick (Harper, 477 pages, \$6.50).

A friendly book and yet honest about a man who inherited a great fortune and responsibilities, with emphasis on Mr. Rockefeller's activities as a philanthropist.

"MEASURING BUSINESS CHANGES," by Richard M. Snyder, (John Wiley, 382 pages).

The author describes over fifty of the key indicators necessary to understand conditions existing in the business world today. A com-

plete guidebook for forecasting business conditions.

"GOVERNMENT STATISTICS FOR BUSINESS USE," edited by Philip M. Hauser, (John Wiley & Sons, 440 pages).

Tells you the content and purposes of the main series of federal statistics, what statistics are available, where to find them, and how to apply them for concrete results.

"INDUSTRIAL VISION," by H. W. Hofstetter (Chilton, 188 pages, \$10.00).

Dr. Hofstetter feels the importance of industrial vision has not been fully understood. He claims more than 80,000 persons in the United States have lost the sight of one eye as a result of industrial hazards.

"WHAT TO DO ABOUT THE DRAFT & MILITARY SERVICE," edited by John Gourlie (Washington Data Service, 36 pages, \$2.95).

A complete description of how the draft works, addressed to young men, telling in detail, various options available. A large color chart is inserted which clearly explains military service options for young men.

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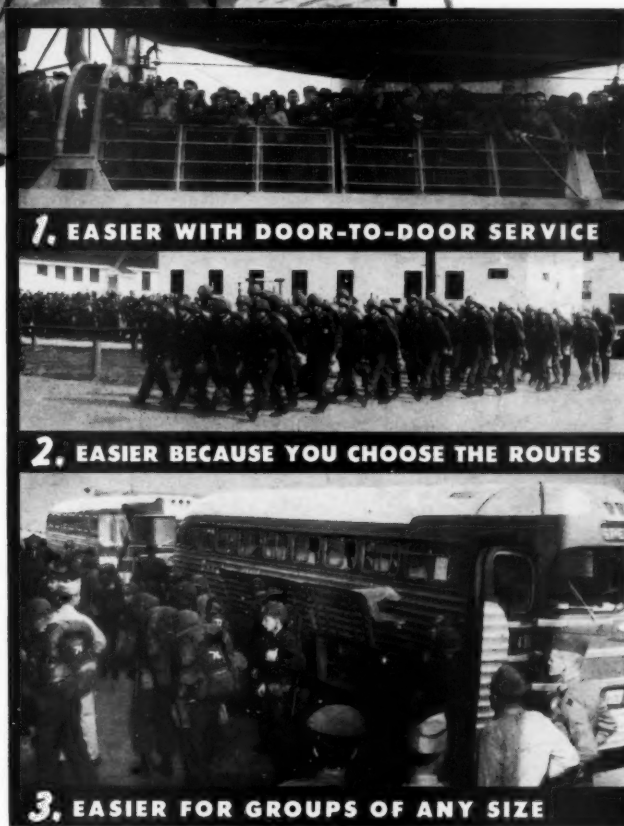
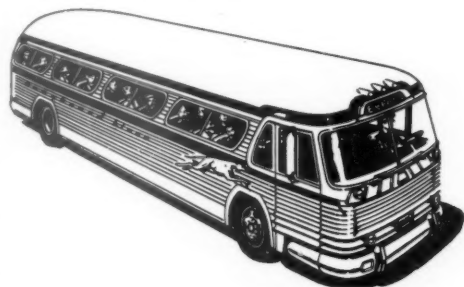
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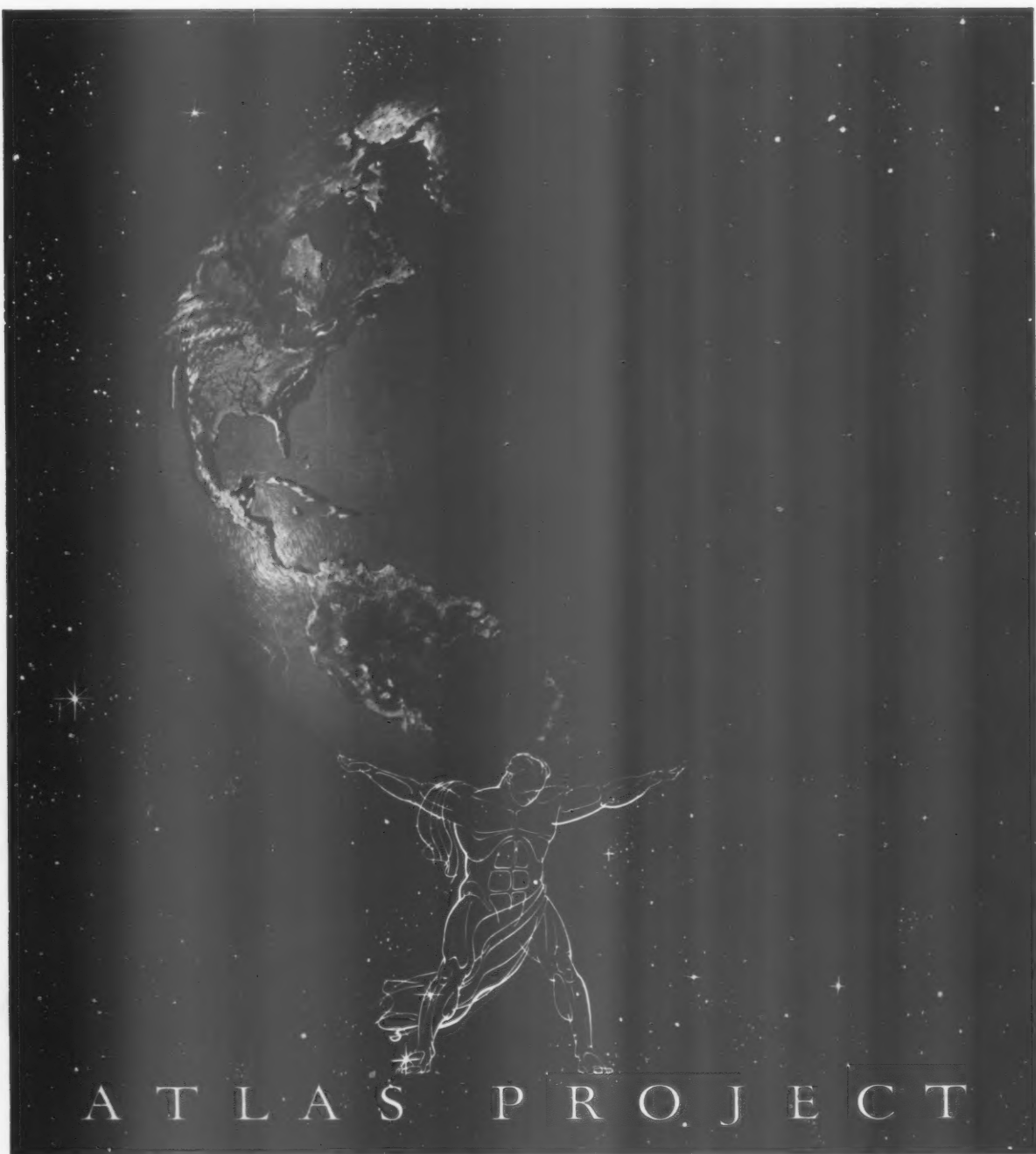
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